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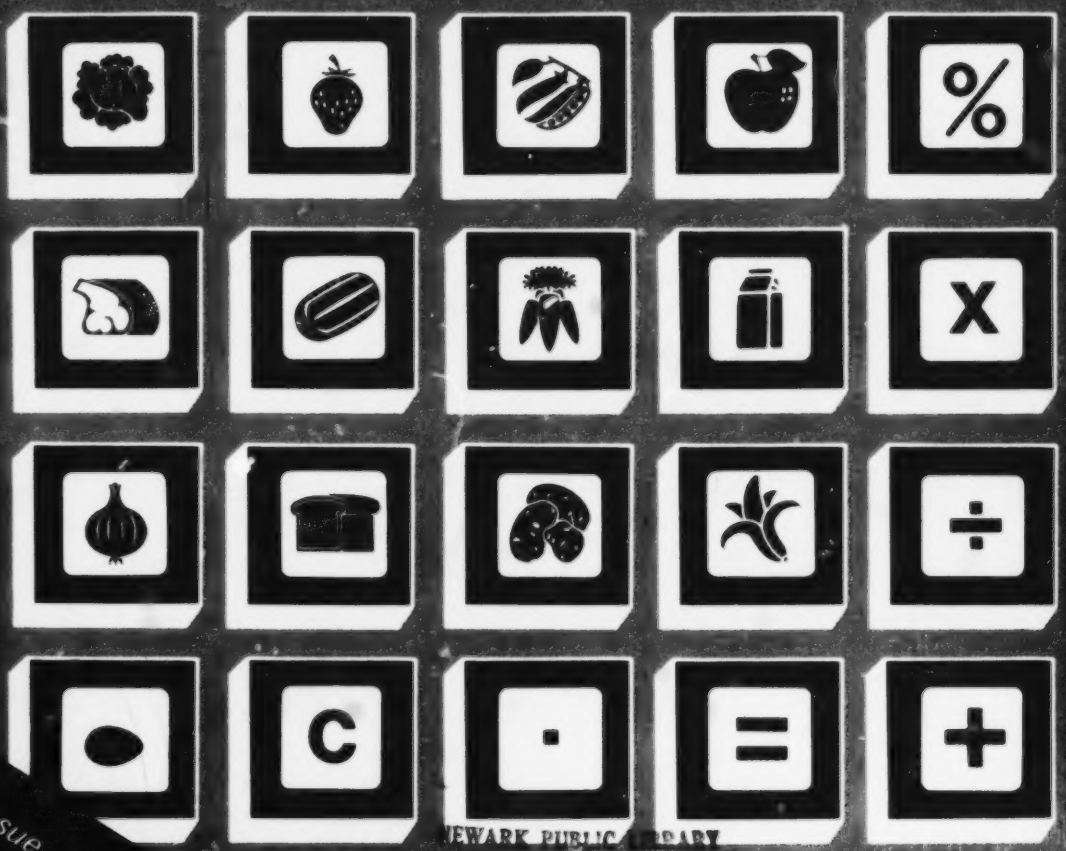
COUNTING AMERICA'S FOOD



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Annual Issue on Food Consumption and Prices

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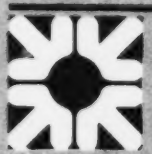

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Consumption Trends Favor Fresh, Lowfat, and Sweet

Karen L. Bunch
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USDA's aggregate food consumption index rose 1 percent in 1984 to a record-high level *(see sidebar box)*. The predominant trends in the latest data indicate that Americans increasingly favor foods that are fresh, lowfat, and sweet. Consumers, for example, are choosing more lowfat milk products and fresh and frozen vegetables. Per capita consumption of many fresh fruits has increased, while canned fruit consumption has fallen. Per capita sweetener use has climbed to historically high levels, while use of fats and oils declined in 1984 for the first time in several years. We are drinking less beer and hard liquor, but more wine and soft drinks.

The food industry has capitalized on these trends with new products advertised as "lite," lean, and convenient. A total of 1,603 new products were introduced in the first 9 months of 1985, 11 percent more than in the same period of 1984. Many of the new products are packaged and sold as frozen or refrigerated foods. Restaurants are taking more orders for salads, pizza, Mexican food, and chicken as customers are eating less steak and hamburger.

Red Meat Down Slightly, Poultry Up

Red meat consumption fell by 0.3 pound in 1984 to 143.7 pounds per capita *(table 1)*. Beef declined 0.1 pound in 1984 to 78.6 pounds, while veal increased 0.2 pound to 1.8 pounds. Pork fell 0.5 pound to 61.7 pounds per capita. Preliminary estimates for 1985 indicate that red meat consumption dropped another 0.3 pound to 143.4 pounds per capita.

Cattle and hog producers continue to liquidate their herds in response to poor returns and cash flow problems. This reduction in livestock inventories is expected to have a major impact on supplies

Table 1. Consumption Data Show Trend to Fresh, Lowfat, and Sweet

Commodity	1970-74	1975-79	1980-84	1982	1983	1984
			Pounds per capita			
Meat, fish, and eggs						
Red meats	150.9	148.1	144.0	139.3	144.0	143.7
Beef and veal	85.9	90.7	79.3	78.8	80.4	80.4
Pork	62.5	56.0	63.2	59.0	62.2	61.7
Lamb and mutton	.6	1.5	1.5	1.5	1.5	1.5
Poultry	49.6	54.4	64.2	64.2	65.5	67.5
Fish, edible weight	12.1	12.9	12.7	12.3	13.1	13.6
Eggs	40.0	34.7	33.6	33.4	33.1	33.0
Dairy products						
Total milk equivalent	553.0	543.0	560.8	559.8	576.3	581.9
Cheese	18.2	20.7	19.7	20.1	20.6	21.7
Fluid milk and cream	272.3	260.4	244.5	241.9	242.3	243.4
Frozen desserts	28.0	27.5	26.6	26.4	27.0	26.9
Fats and oils						
Total	55.8	57.4	61.4	61.4	63.2	61.6
Animal fats	14.0	11.4	13.1	12.5	13.4	13.5
Vegetable oils	41.8	46.0	48.3	48.9	49.8	48.1
Fruits						
Fresh	76.3	80.9	85.7	83.9	87.5	86.6
Processed						
Juices[1]	27.4	31.2	32.7	NA	NA	NA
Canned, frozen, and dried	27.3	24.1	20.8	18.8	18.8	NA
Vegetables						
Fresh[2, 3]	90.0	93.5	NA	71.2	71.0	75.4
Canned[1, 2]	35.5	34.9	NA	32.6	33.7	32.6
Frozen	10.0	10.3	11.2	10.7	11.1	12.0
Potatoes and sweetpotatoes[3]						
Total, fresh weight equivalent	121.7	124.2	122.4	120.8	125.3	125.6
Fresh, retail weight	54.8	54.0	52.9	51.8	53.8	53.1
Processed, retail weight	21.4	23.4	26.1	25.8	27.1	27.4
Grain products						
Wheat flour	111.0	116.3	117.3	119.6	116.1	117.8
Pasta	8.6	10.4	11.5	11.5	11.6	12.3
Breakfast cereals	11.5	12.5	12.3	12.2	12.2	12.2
Rice	7.2	7.9	10.2	11.8	9.8	8.6
Sugar and sweeteners						
Corn sweeteners	26.9	40.4	61.2	73.7	71.0	77.3
Sugar (refined)	100.5	91.5	75.1	73.8	71.0	67.5
Nonalcoholic beverages						
Coffee (gallons)	32.2	27.1	26.0	25.3	25.2	25.8
Soft drinks (gallons)	25.5	32.7	40.3	39.5	41.1	44.2
Aggregate food consumption index (1967=100)	102.5	104.2	105.6	104.5	106.7	107.5

[1]Total not available for some years due to lack of data for specific items. [2]Beginning in 1982, data are not comparable to previous years. [3]Excludes consumption of home garden produce. NA = Not available.

The author is an agricultural economist with the Food Marketing and Consumption Economics Branch of the National Economics Division.

Total Pounds of Food No Longer Reported by ERS

Beginning in 1981, cutbacks in the USDA budget for collection of production statistics, as well as reductions in data from industry sources, have limited ERS' ability to measure supply and utilization of a number of fruit and vegetable categories with the same accuracy as in the past. ERS has decided not to compromise the integrity of the consumption series by including far less accurate estimates of fruit and vegetable consumption than previously published.

Furthermore, ERS is no longer able to accurately calculate total pounds of food consumed. Instead, the index of per capita food consumption can be used to measure annual changes in the quantity of retail food consumed per person. In addition to the total, separate indices are calculated for meat, poultry, and fish; eggs; dairy products; fats and oils; vegetables; fruits; potatoes and sweetpotatoes; beans, peas, and nuts; flour and cereal products; sugar and other sweeteners; and coffee, tea, and cocoa.

The index series has been published since 1950. However, because of the recent lack of data for certain items, ERS was forced to adjust the index for the entire 1965-84 period to include only those items for which 1984 data were available.

To illustrate how the food consumption index is calculated and interpreted, consider 1984 as an example. Pounds of food consumed on a retail weight basis in that year were multiplied by prices in the base year, 1967. The result was divided by the identical calculation for 1967. An index value of 105.5 for meat, poultry, and fish in 1984 indicates that total per capita consumption of those foods was 5.5 percent above the 1967 base year.

Because the prices are held constant at the base year values, changes in the index reflect changes in the quantity of foods consumed, as well as shifts from low-priced to higher priced foods. This means that a 1-pound increase in beef consumption will have a greater influence on the total food index than an identical increase in flour.

Further information on the food consumption index will be presented in a forthcoming ERS report, *Statistics on Consumption and Utilization of Agricultural Commodities: How they are Constructed and Used*. For ordering details, contact Karen Bunch, (202) 786-1870.

of meat in 1986, possibly cutting consumption by more than 5 percent *(table 2)* to 135.8 pounds per capita. That would be the lowest level in 24 years.

Poultry continues its 20-year rise in popularity. Americans ate about 1 percent more turkey, while chicken consumption increased another 3 percent to a record 55.7 pounds. Demand for poultry was strong in 1985 and is expected to rise again in 1986, with per capita gains of 3 and 4 percent each year.

In the last 15 years, increases in poultry have more than offset declines in red meat, so that total meat consumption per capita gradually trended upward *(figure 1)*. For red meats, annual average consumption in 1980-84 was 144.0 pounds, compared with 148.1 for 1975-79 and 150.9 in 1970-74. In contrast, poultry consumption increased steadily from 49.6 pounds in 1970-74 to 64.2 pounds in 1980-84. Over this period, retail poultry prices have fallen 24 percent relative to red meat prices. Because of expected reductions in beef and pork supplies, combined per capita consumption of red meat and poultry will probably decline in 1986, but remain near 1985's record level.

Table 2. Per Capita Food Consumption Expected To Decline in 1986

Commodity	1985[1]	1986[2]
	Percent change from previous year	
Total food	+1	−1 to −2
Animal products	+1	−2 to −3
Meat	0	−5 to −6
Poultry	+3	+3 to +4
Fish	+1	+1 to +2
Dairy	0 to +1	0 to +1
Crop products	+1	0 to −1
Fats and oils	+2	−1 to −2
Vegetables	0 to +1	+1 to +2
Fruit	−1 to 0	0
Potatoes	0 to +1	0 to +1
Cereal products	+2	0 to +1
Sugar and sweeteners	+1	0 to +1

[1]Preliminary. [2]Forecast.

Fish consumption rose nearly 4 percent in 1984 to 13.6 pounds per capita (excluding game fish), a new high. Americans are eating 12 percent more fish than in 1970-74, with most of the increase in fresh and frozen products. The fish industry has benefited from the healthy image of its product, as well as from increased away-from-home eating. U.S. Department of Commerce analysts estimate that 60 percent of fish is eaten away from home.

Fish consumption should continue to gain in the next few years with the introduction of new products and a greater availability of fresh fish in supermarkets.

Total Dairy Products Up

Use of dairy products increased 1 percent in 1984 to 581.9 pounds per capita on a milk-equivalent basis (the amount of milk required to produce the different dairy products). The actual weight of the products totaled 306.2 pounds, up slightly from 303.9 pounds in 1983. Consumption of cheese, lowfat and skim milk,

canned milk, and cream and specialty products increased in 1984.

Despite stable retail prices and a government-sponsored dairy promotion program that began in September 1984, per capita fluid milk consumption increased only slightly in 1984. Whole milk consumption decreased 3.6 percent to 125.2 pounds per capita, while lowfat milk products increased 3.9 percent to 111.3 pounds.

Cream products regained popularity in 1984, with increases in the consumption of half-and-half and heavy and sour varieties. Total consumption of cream reached 6.9 pounds per capita, the highest level in 20 years. Yogurt sales continued to climb, increasing 12.5 percent in 1984 to 3.6 pounds. Since 1970, yogurt sales have increased more than 350 percent.

Cheese grew even more popular in 1984, with both American and other types increasing 4 percent to 21.7 pounds per capita. USDA distributed 594 million pounds of free cheese in 1984, down 6 percent from the 1983 high. These donations accounted for approximately 12 percent of total cheese consumption and 21 percent of the American cheese eaten in 1984.

Figure 1. Red Meat Consumption Expected To Decline Further

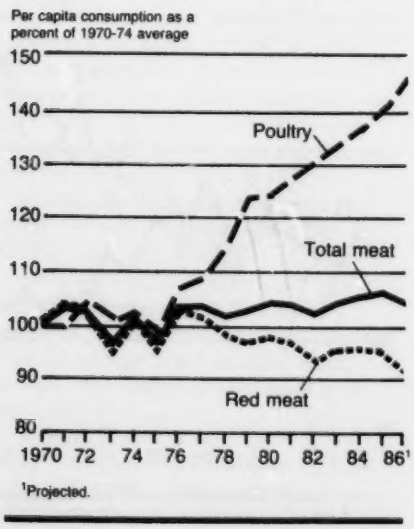
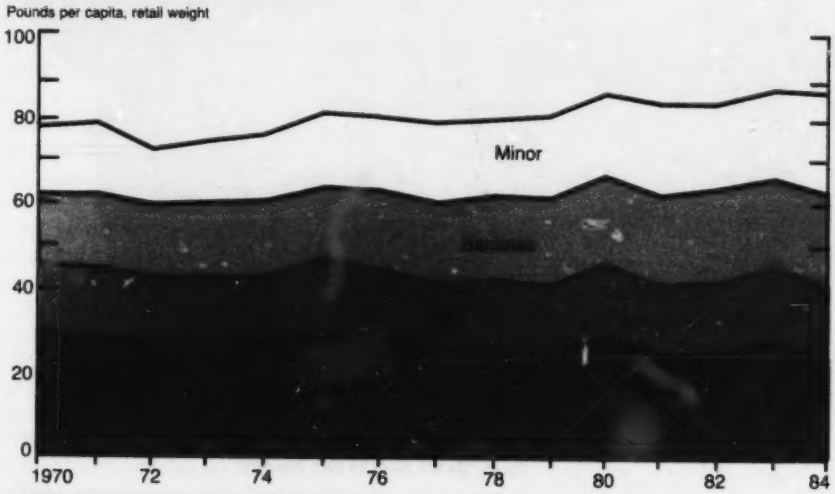


Figure 2. Fresh Fruit Consumption Shifts to Minor Fruits



Per capita consumption of Italian-type cheeses (particularly mozzarella) has more than doubled in the last 15 years, and these cheeses now account for 25 percent of total cheese use. Increased popularity of pizza and other Italian dishes have contributed to expanded use. However, cheddar cheese is still the American favorite at 2.3 billion pounds in 1984, roughly 42 percent of total cheese consumption.

Trends toward lowfat milk and cheese are expected to continue in the next few years. Based on data through September 1985, sales of whole milk were down 3 percent last year, while lowfat and skim milk increased 7 percent. Sales of cheese other than American increased an estimated 5 percent in 1985. Overall dairy product consumption is projected to increase by less than 1 percent on a per capita basis in both 1985 and 1986.

Fats and Oils Decline

Use of fats and oils declined in 1984 for the first time in 7 years. Total product weight fell 2.5 percent to 61.6 pounds per capita, with declines in butter, margarine, and salad oil. Supplies of soybean oil—the primary oil used in margarine, shortening, and salad and cooking oils—were tight in 1984 after the summer 1983 drought. Retail prices rose by more than 9 percent.

Because of smaller supplies of vegetable oils, consumption of animal fats increased 1.5 percent in 1984 as manufacturers turned to these cheaper substitutes. Animal fats account for approximately 25 percent of the fat used in shortening.

Per capita consumption of fats and oils rose an estimated 2 percent in 1985, with increased use of shortening, salad oils, and edible tallow. Supplies of most vegetable oils have rebounded from the 1983/84 drought-reduced levels. As a result, retail prices declined significantly between 1984 and 1985.

Fruit Consumption Shifts To Noncitrus

Fresh fruit consumption totaled 86.6 pounds per capita in 1984, down 1 percent from 1983. The decrease was mainly

Consumption of flour and cereal products has been increasing in recent years after declining dramatically from the levels set early in this century.

the result of smaller supplies of citrus fruit, down 17 percent from 1983's record level. Supplies of citrus were reduced because trees were heavily damaged by freezing temperatures in 1983. Retail citrus prices rose by more than 30 percent in 1984.

Consumers ate 6 percent more fresh noncitrus fruit, with significant gains in strawberries, peaches, and plums. This shift to noncitrus fruits has been a trend for the last decade. Fresh fruit consumption increased 13.6 percent between 1970-74 and 1984. While apples, oranges, and bananas still account for 60 percent of total fresh fruit sales, most of the increase was in minor fruits such as strawberries, nectarines, avocadoes, and grapes *(figure 2)*. Improved marketing and greater off-season availability, as well as consumer demand for variety, have led to increases for these fruits *(see NFR-28, page 6)*.

One of the greatest gainers has been strawberries. In 1984, consumption increased 27 percent to a 40-year high of 2.8 pounds per capita. Other fruits to gain in recent years were plums, nectarines, and grapes, with grapes up 52 percent since 1980. Avocadoes have been increasing faster than any other fresh fruit, with per capita consumption up 250 percent since 1970-74. In 1984, consumption of avocadoes was 2.1 pounds, higher than that of cherries, nectarines, pineapples, or plums.

Smaller supplies for most major fruits led to slightly reduced consumption in 1985. Preliminary data show supplies of apples, pears, peaches, and citrus were 3-10 percent below 1984 levels. Fruits showing consumption gains included strawberries, grapes, and especially nectarines. Supplies of nectarines were up more than 9 percent from 1984 levels.

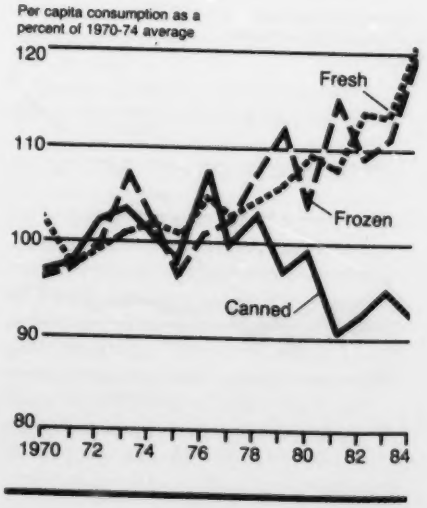
Another tree crop, nuts, also gained popularity, rising almost 30 percent since the early 1970's from 1.8 pounds to 2.2 pounds per capita in 1984. Almonds are the most popular nut, followed by walnuts and pecans. About 30 percent of nuts end up in candy, ice cream, and other products, while the remainder are sold directly, either shelled or unshelled. Nut consumption—especially pistachios—should continue to increase. The California pistachio industry has been expanding, and consumers can expect larger supplies and lower prices in the next few years.

Vegetable Consumption Shows Large Gains

Total consumption of the eight major commercial fresh vegetables increased 6.3 percent in 1984, the largest rise in more than 20 years. The biggest gain was for tomatoes, which increased 18 percent over 1983 to 13.7 pounds per capita. Americans also ate more broccoli, carrots, cauliflower, celery, lettuce, and onions, while corn consumption did not change. Frozen vegetables (excluding potatoes) rose 8 percent in 1984 to 12 pounds per capita. In contrast, canned vegetables declined 3 percent.

Over the last 15 years, the trend in vegetable consumption has been toward fresh and frozen and away from canned, which is off 8 percent since the early 1970's. The only canned vegetable to remain strong is tomato products, which have increased 14 percent since 1970-74. Over the same period, fresh and frozen vegetables increased 21 and 20 percent, respectively *(figure 3)*. Americans are willing to pay more for these products; since 1977, prices have risen 10 percent relative to canned.

Figure 3. Canned Vegetables Lose to Fresh and Frozen



Demand for fresh and frozen vegetables was strong in 1985. However, celery, carrot, and lettuce supplies were affected by hot weather in California, and consumption declined. Final data for 1985 should show significant gains of 3-5 percent per capita for broccoli, cauliflower, and tomatoes. Frozen vegetable consumption is also expected to increase in the next few years, with the largest gains for broccoli and corn.

Consumption of Grains Trending Upward

Consumption of flour and cereal products has been increasing in recent years after declining dramatically from the levels set early in the century. In 1984, total per capita use of flour and cereal products was 149.2 pounds, compared with 139.4 pounds in 1970-74, 204 pounds in 1945-49, and 287 pounds in 1910-15.

Wheat flour represents about 80 percent of total flour and cereal product use. The average annual use of wheat flour for 1980-84 was 117.3 pounds per capita, up 5.7 percent from the average for 1970-74. One reason for the increase has been the rise in popularity of pasta products, up from 8.6 pounds per capita in 1970-74 to 12.3 pounds in 1984.

Consumption has increased for other cereal products as well. Use of corn meal rose 8.5 percent over the last 10 years to 6.6 pounds per capita in 1984. Rice consumption increased 19 percent over the same period, though it has declined in the last 2 years. In 1984, it was 8.6 pounds per capita. Rye, barley, oats, and hominy have declined since the mid-1960's.

Breakfast cereal has also been rising and is currently 12.2 pounds per capita. Average annual consumption of ready-to-eat cereal was 10.1 pounds per capita in 1980-82 (more recent data are not available), a 13-percent increase from the 1970-74 average of 8.9 pounds. Ready-to-cook cereal declined 13 percent over the same period.

Sugar Consumption Continues To Rise

Despite weight consciousness and calorie counting, Americans increased their intake of total caloric sweeteners by 3 percent in 1984 to 146.6 pounds per capita, an all-time high. All of this increase stemmed from an 18-percent rise in the use of high fructose corn syrup (HFCS), roughly two-thirds of which is used in soft drinks. Because of increased substitution of HFCS in processed products, refined sugar consumption declined 5 percent in 1984 to 67.5 pounds per capita, the lowest level on record. At the same time, corn sweetener consumption reached 77.3 pounds, the highest on record.

America's appetite for sweets does not appear to be decreasing. Final data for 1985 are expected to show another 1-percent increase in total caloric sweetener consumption as an 8.4-percent decline in refined sugar will be offset by a sharp 17.6-percent increase for HFCS.

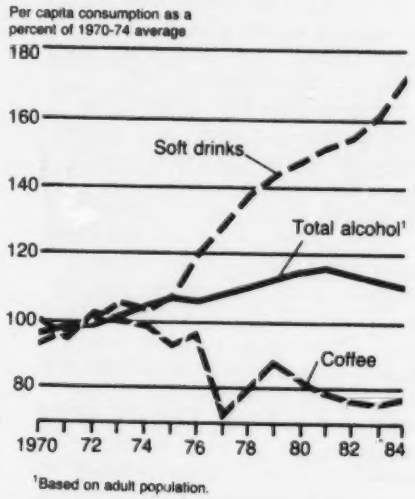
These large increases in HFCS are not expected to continue in 1986. HFCS is quickly reaching full market penetration for processing use, and further gains will depend on increases in the consumption of final products—primarily soft drinks. However, most of the future growth in soft drinks is expected to be in diet products.

The use of aspartame, a noncaloric sweetener marketed as Nutrasweet, reached 5.8 pounds per capita, sugar sweetness equivalent, in 1984. That's more than double the 2 pounds consumed in 1983. Saccharine use also jumped in 1984, up 5.3 percent to 10 pounds per capita. Aspartame should continue to increase at a high rate as more products are marketed containing this sugar substitute. Currently in development is a frozen dessert product with Nutrasweet.

Alcohol Consumption Declining

Total alcohol consumption has leveled off in recent years, after increasing 16 percent between 1970-74 and 1981. Based on the adult population (21 years and over), per capita beer consumption fell in 1984 for the third consecutive year to 36.5 gallons per capita. Distilled spirits also declined. Wine is the only alcoholic beverage that continues to gain *(figure 4)*, increasing 2.9 percent in 1984 to 3.4 gallons per adult. Consumption of wine coolers, a new beverage that combines citrus juice and wine, was 0.2 gallon per adult in 1984.

Figure 4. Alcohol Levels Off, While Soft Drinks Continue To Rise



Soft drink consumption rose 7.5 percent in 1984 to 44.2 gallons per capita, the largest increase since the mid-1970's. Diet drinks increased from 18 to 20 percent of the total. Coffee drinking also increased for the first time since 1979, rising 2 percent to 25.8 gallons per capita. □

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Nutrient Content of the Food Supply

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The U.S. food supply in 1984 provided between 2 and 5 percent more iron, vitamin A, calcium, and vitamin B_{12} than it did in 1983. Food energy (calories) and eleven other nutrients increased 1 percent or less *(table 1)*. Only ascorbic acid saw a decline in 1984, falling 3 percent.

Compared with 1967-69 levels, the 1984 levels ranged from 1 to 17 percent higher for all nutrients except vitamin B_{12}, which declined 4 percent, and cholesterol, which dropped 8 percent.

Nutrient levels of the U.S. food supply partly reflect changes in the market in response to shifts in consumer demand and factors affecting the availability of food. These include transitory factors such as unusual weather conditions or a specific event such as revised Federal enrichment standards. Longer term changes in nutrient levels may reflect substantial shifts in consumer eating habits and preferences.

The data in this article are based on per capita food consumption estimates but are not adjusted for loss or waste of food or nutrients during processing, marketing, or home use *(see sidebar box)*. For this reason, the data measure the amount of food and nutrients available for consumption from the U.S. food supply, rather than the quantity of food or nutrients actually consumed by Americans.

A freeze-damaged orange crop was largely responsible for the 3-percent decline in the level of ascorbic acid in 1984's food supply.

Changes in Nutrient Levels, 1983-1984

Iron: The 5-percent increase in iron primarily reflected the revised Federal standard for enrichment of white flour with this nutrient. Effective July 1, 1983, the standard for iron was increased from 13 to 20 milligrams (mg) per pound of flour. As a result, the grain products group, comprised largely of flour, accounted for 85 percent of the increase in iron between 1983 and 1984. Grain products were the leading source of iron after 1979 when they surpassed the meat, poultry, and fish group *(table 2)*.

Vitamin A: Increased use of dark green and deep yellow vegetables, particularly good sources of vitamin A, accounted for over half of the 3-percent rise in 1984. Vegetables were the leading source of vitamin A, but dairy products, poultry, and spices also contributed to the higher vitamin A level.

Calcium: The 2-percent increase since 1983 reflected greater use of cheese, lowfat milk, and yogurt. Dairy products —the chief source of calcium— accounted for 85 percent of the gain. *(For more details on this nutrient, see the "Closeup" section later in this article.)*

Vitamin B_{12}: This nutrient occurs naturally only in foods of animal origin, but small amounts are added to grain products in the fortification of cereals. The 2-percent increase reflected a small rise in the use of some fish and shellfish, poultry, and dairy products. Although fish and shellfish account for a relatively small proportion of the meat, poultry, and fish group, they are more concentrated sources of vitamin B_{12} than red meats (other than offal) and poultry.

Ascorbic acid: The decreased supply of citrus products in 1984 resulted in a 3-percent decline in the level of ascorbic acid. Use of fresh oranges, the citrus fruit used in largest quantities, declined

The authors are home economists with the Human Nutrition Information Service of USDA.

from 15 to 12 pounds per capita following severe winter weather conditions. Citrus products were the largest single source of ascorbic acid among the food groups, providing 29 percent in 1983 and 26 percent in 1984. Vegetables, potatoes, and noncitrus fruits (in that order) were other important sources. The decrease in ascorbic acid from citrus products was only partially offset by small gains from other foods.

Other nutrients: The 1984 levels for food energy, fat, and thiamin were about the same as in 1983. Increases of roughly 1 percent occurred for protein, carbohydrate, phosphorus, magnesium, riboflavin, niacin, vitamin B_6, zinc, and cholesterol. These changes were related to small increases in the use of dairy products, animal fats, poultry, corn syrups, and miscellaneous foods.

Changes Between 1967-69 and 1984

Major sources of most nutrients were the same in 1967-69 and 1984. However, leading sources shifted for three nutrients—grain products replaced meat, poultry, and fish as the major source of iron; dark green and deep yellow vegetables replaced meat, poultry, and fish as a source of vitamin A; and citrus products replaced other vegetables as a source of ascorbic acid. In addition, changes occurred in the nutrient contributions of specific foods within the groups.

Ascorbic acid: Fruits and vegetables, excluding potatoes, accounted for the 17-percent increase in ascorbic acid from 1967-69 to 1984. Together, these two food groups provided roughly three-fourths of the ascorbic acid in the food supply during those 15 years, but changes occurred in use of specific foods witnin the groups. Increased use of citrus products, mainly frozen orange juice, accounted for about one-third of the total gain in ascorbic acid. Vegetables, particularly fresh, also contributed substantially to the higher level of ascorbic acid because of increased use of especially good sources such as cauliflower and broccoli. Fortification of fruit juices, fruit drinks, and other miscellaneous foods with ascorbic acid also contributed to the increase. Ascorbic acid from such fortification doubled between 1967-69 and 1984.

Thiamin, Riboflavin, and Niacin: Federal standards for enrichment of white flour with thiamin, riboflavin, and niacin became effective July 1, 1975. These higher standards and a 5-pound increase in per capita use of flour between 1967-69 and 1984 were largely responsible for the gains of 9 percent in the level of thiamin in the food supply, 5 percent for riboflavin, and 4 percent for niacin.

Grain products were the leading source of thiamin between 1967-69 and 1984, with their share increasing from 35 to 42 percent during the period. This increased contribution reflected, in part, a declining proportion from decreased use of meat and some dairy products. Use of meat declined about 5 pounds, while dairy product use fell 35 pounds (product weight). Per capita use of flour, the major component of the grain product group, was 118 pounds in 1984, up from 113 pounds in 1967-69.

The higher enrichment levels and greater use of grain products were also primarily responsible for the increased level of riboflavin between 1967-69 and 1984. The proportion of riboflavin from grain products increased from 18 percent in 1967-69 to 23 percent in 1984, while the share from dairy products declined from 37 to 35 percent, and that from the meat, poultry, and fish group fell from 23 to 22 percent. Among dairy products, the decrease in riboflavin from less use of whole milk offset the gain from use of more lowfat milk and cheese. The decline in riboflavin from use of less red meat was almost offset by the marked increase in use of poultry.

Most of the increase in niacin came from grain products and poultry. Grain products, primarily flour, provided 60 percent of the increase in niacin, compared with 38 percent provided by poultry. Poultry's share of niacin rose from

Table 1. Nutrients Available for Consumption, Per Capita Per Day[1]

Nutrient (unit)	1909-13	1967-69	1983	1984	Percent change[2] 1967-69 -1984	Percent change[2] 1983-1984
Food energy (kcal)	3,450	3,270	3,440	3,450	5	–
Protein (gm)	99	98	101	102	4	1
Fat (gm)	124	157	166	166	6	–
Carbohydrate (gm)	488	375	395	399	6	1
Calcium (mg)	759	902	907	924	2	2
Phosphorus (mg)	1,506	1,500	1,520	1,541	3	1
Magnesium (mg)	392	329	335	340	3	1
Iron (mg)	15.0	16.7	18.0	18.8	12	5
Zinc (mg)	12.9	12.1	12.2	12.3	1	1
Vitamin A value (IU)	8,200	7,700	8,000	8,200	6	3
Thiamin (mg)	1.65	1.98	2.16	2.16	9	–
Riboflavin (mg)	1.79	2.27	2.35	2.38	5	1
Niacin, preformed (mg)	18.8	23.4	26.2	26.6	14	1
Vitamin B_6 (mg)	2.15	1.92	2.01	2.03	6	1
Vitamin B_{12} (mcg)	7.9	9.2	8.6	8.8	−4	2
Ascorbic acid (mg)	98	100	120	116	17	−3
Cholesterol (mg)	502	524	478	481	−8	1

[1]Quantities of nutrients are computed by the Human Nutrition Information Service (HNIS), USDA, on the basis of estimates of per capita food consumption (retail weight) prepared by the Economic Research Service. Includes HNIS estimates of produce from home gardens. No deductions are made in estimates for loss of food in processing, marketing, or in the home, use for pet food, or for loss of nutrients during the preparation of food. Data include iron, thiamin, riboflavin, niacin, vitamin A value, vitamin B_6, vitamin B_{12}, and ascorbic acid added in enrichment and fortification. [2]Percentages are based on aggregate data.

10 to 14 percent because of the rise in per capita use from 46 pounds in 1967-69 to 68 pounds in 1984.

Iron: A 12-percent rise in the iron level between 1967-69 and 1984 was also attributed to increased use of grain products and the 1983 revision in the Federal standard for enrichment of white flour with iron. Grain products were the leading source of iron in 1984, providing 36 percent of the total, up from 30 percent in 1967-69. The meat, poultry, and fish group provided a smaller proportion of iron in 1984 because of less use of red meat. Poultry, although not as concentrated a source of iron as red meat, provided a little more iron in 1984 than in 1967-69 because of the substantial increase in use.

Vitamin A: The 6-percent increase for vitamin A between 1967-69 and 1984 was attributed primarily to use of more dark green and deep yellow vegetables. These foods accounted for 24 percent of the vi-

Table 2. Contribution of Major Food Groups to Nutrient Levels

Food group	Food energy	Protein	Fat	Carbohydrate	Calcium	Phosphorus	Magnesium	Iron	Zinc	Vitamin A value	Thiamin	Riboflavin	Niacin	Vitamin B_6	Vitamin B_{12}	Ascorbic acid	Cholesterol
									Percent								
1967-69																	
Meat, poultry, and fish	21.6	42.4	37.3	0.1	4.0	27.5	13.6	31.7	47.9	23.2	30.0	23.3	48.1	40.7	71.3	2.1	35.1
Eggs	2.1	5.4	3.1	0.1	2.7	5.3	1.6	5.4	5.2	2.9	1.9	5.8	0.1	2.7	7.4	0.0	45.7
Dairy products, excluding butter	10.9	21.0	12.4	6.7	76.1	35.9	20.4	2.2	18.8	11.9	11.5	37.4	2.0	11.6	20.1	4.4	13.7
Fats and oils, including butter	17.1	0.2	40.2	[1]	0.2	0.1	[1]	0.1	0.1	8.4	[1]	0.1	[1]	[1]	0.0	0.0	5.5
Citrus fruits	0.8	0.4	0.1	1.7	0.9	0.6	2.0	0.8	0.4	1.2	2.3	0.4	0.7	1.3	0.0	24.9	0.0
Noncitrus fruits	2.2	0.6	0.2	4.9	1.2	1.2	4.1	3.7	0.9	6.2	1.8	1.6	1.8	6.6	0.0	13.0	0.0
Potatoes and sweet potatoes	3.0	2.5	0.1	5.6	1.1	3.8	7.8	4.5	3.4	7.4	5.1	1.7	6.9	11.4	0.0	18.1	0.0
Dark-green, deep-yellow vegetables	0.2	0.3	[1]	0.4	1.1	0.5	1.7	1.3	0.4	20.7	0.7	0.7	0.5	1.6	0.0	8.0	0.0
Other vegetables, including tomatoes	2.0	2.7	0.3	3.9	4.2	4.1	8.8	8.1	3.7	11.7	5.6	4.0	4.7	9.2	0.0	26.7	0.0
Dry beans and peas, nuts, soy products	2.9	5.1	3.5	2.1	2.7	5.8	11.4	6.6	4.3	[1]	5.2	1.8	6.6	4.8	0.0	[1]	0.0
Grain products	19.9	18.6	1.4	36.5	3.6	12.9	19.0	29.6	12.3	0.4	35.3	17.7	23.6	9.8	1.2	0.0	0.0
Sugar and other sweeteners	16.4	[1]	0.0	37.1	0.3	0.1	0.3	0.9	0.1	0.0	[1]	0.1	[1]	0.1	0.0	[1]	0.0
Miscellaneous[1]	0.8	0.7	1.5	0.7	2.1	2.3	9.2	5.0	2.3	6.0	0.4	5.4	5.0	0.1	0.0	2.8	0.0
1984																	
Meat, poultry, and fish	20.3	42.9	34.2	0.1	4.1	27.5	13.9	28.2	47.1	20.8	25.9	22.1	45.6	40.3	71.9	2.0	39.8
Eggs	1.6	4.3	2.4	0.1	2.2	4.2	1.3	4.0	4.2	2.3	1.5	4.6	0.1	2.1	6.4	0.0	41.1
Dairy products, excluding butter	10.3	20.9	11.7	6.0	75.8	35.8	19.1	2.3	19.7	11.6	8.9	34.7	1.6	11.5	20.1	3.1	14.0
Fats and oils, including butter	18.7	0.2	44.0	[1]	0.2	0.1	[1]	0.1	0.1	7.5	[1]	0.1	[1]	[1]	0.0	0.0	5.1
Citrus fruits	0.9	0.5	0.1	1.9	0.9	0.7	2.2	0.7	0.5	1.5	2.7	0.5	0.8	1.3	0.0	26.2	0.0
Noncitrus fruits	2.3	0.7	0.4	4.9	1.4	1.3	4.6	3.7	1.0	5.5	1.9	1.8	1.8	7.5	0.0	13.2	0.0
Potatoes and sweet potatoes	3.1	2.6	0.1	5.8	1.1	4.0	8.0	4.7	3.4	5.3	5.2	1.6	6.7	10.9	0.0	16.0	0.0
Dark-green, deep-yellow vegetables	0.2	0.4	[1]	0.5	1.4	0.7	2.0	1.4	0.5	24.0	0.8	1.0	0.6	2.1	0.0	10.9	0.0
Other vegetables, including tomatoes	1.9	2.6	0.2	3.7	4.1	4.0	8.5	7.2	3.5	12.0	5.2	3.9	4.3	9.0	0.0	24.1	0.0
Dry beans and peas, nuts, soy products	3.1	5.7	3.8	2.1	3.1	6.4	12.7	6.6	5.0	[1]	5.4	2.1	6.7	5.1	0.0	[1]	0.0
Grain products	19.5	18.4	1.3	35.5	3.6	12.7	18.4	35.7	12.3	0.3	41.9	23.0	27.9	10.1	1.7	0.0	0.0
Sugar and other sweeteners	16.9	[1]	0.0	38.6	0.3	0.1	0.3	0.7	0.1	0.0	[1]	0.4	[1]	[1]	0.0	[1]	0.0
Miscellaneous[2]	1.0	0.9	1.7	0.8	1.8	2.5	8.9	4.7	2.7	9.1	0.5	4.3	3.9	0.1	0.0	4.4	0.0

[1]Less than 0.05 percent. [2]Includes coffee, tea, chocolate liquor equivalent of cocoa beans, spices, and fortification of products not assigned to a food group.

Developing the Data

USDA's Human Nutrition Information Service (HNIS) annually compiles data on the nutrient content of the U.S. food supply, estimating per capita per day food energy and nutrients in foods available for consumption. Additionally, HNIS estimates the percentage contribution of each nutrient provided by the 13 major food groups. The historical series dates from 1909.

HNIS researchers derive their estimates by using data on foods available for consumption from USDA's Economic Research Service (ERS) and information on the nutrient composition of foods. ERS determines the amount of food available by subtracting data on exports, year-end inventories, nonfood use, and military procurement from total production, imports, and beginning inventories. However, subsequent food losses during processing, marketing, and home use are not considered. Therefore, quantities of food available for consumption include a larger amount than is actually eaten. To make this distinction clear in the article, food available for consumption is referred to as "use" rather than consumption.

tamin A in 1984, compared with 21 percent in 1967-69. At that time, the meat, poultry, and fish group was the chief source, providing 23 percent. The increase from dark green and deep yellow vegetables more than offset the sizable decline in vitamin A from the meat group, primarily from less use of edible offal. Offal, which includes organ meats such as liver, is used in the manufacture of luncheon meats and is a concentrated source of vitamin A. Sweetpotatoes, also a concentrated source of vitamin A, provided less of this vitamin because of decreased use.

Vitamin B_6: The vitamin B_6 level rose 6 percent, primarily from the large increase in use of poultry. This increase and smaller gains from fruits, vegetables, dairy, and grain products more than offset the small decline from use of less red meat.

Magnesium and phosphorus: Magnesium and phosphorus levels each rose 3 percent between 1967-69 and 1984. Greater use of lowfat milk, cheese, poultry, nuts, and noncitrus fruits accounted for the rise in magnesium and more than compensated for the decline resulting from less use of whole milk and meats. Greater use of poultry, lowfat milk, and cheese accounted for the increase in phosphorus. Increased use of nuts, mostly peanuts, also contributed to the gain because of their high phosphorus content.

Calcium: This nutrient, provided mainly by dairy products, increased 2 percent between 1967-69 and 1984 because of the marked gain in use of lowfat milk and cheese. Despite its declining contribution, whole milk remains the leading source of calcium among the dairy products, with cheese a close second. Although dairy products accounted for roughly two-thirds of the gain in calcium, other food groups also contributed.

Zinc: The 1-percent increase in zinc between 1967-69 and 1984 reflected gains from poultry and some other foods. These gains were almost offset by the decline from red meats.

Vitamin B_{12} and cholesterol: Between 1967-69 and 1984, the level for vitamin B_{12} declined 4 percent and cholesterol 8 percent. The decline in per capita use of eggs from 306 to 253 was chiefly responsible for the lower level of cholesterol. In addition, small declines in cholesterol also resulted from decreased use of butter and lard. A decline in the use of eggs and meats (largely offal, a concentrated source of vitamin B_{12}) was responsible for the lower level of vitamin B_{12}.

Food energy: The level of food energy in the food supply is determined by amounts of the three energy-yielding nutrients—protein, fat, and carbohydrate. Fat provides more than twice as many calories per gram than either protein or carbohydrate. The 5-percent increase in food energy between 1967-69 and 1984 resulted from a 4-percent rise in protein and 6-percent gains for fat and carbohydrate.

The higher fat level resulted from increased per capita use of shortening from 16.4 to 21.3 pounds and edible oils from 15.9 to 21.1 pounds. The increase in carbohydrate was attributed primarily to greater use of corn syrups. Use of high fructose corn syrup (HFCS), which was first reported in the late 1960's, increased dramatically, rising from 1.0 pound in 1970 to 51.1 pounds per capita in 1984. Soft drinks accounted for over two-thirds of the total use of HFCS in 1984. Almost 90 percent of the total gain in the protein level was attributed to increased use of poultry.

Closeup on Calcium

Calcium is an essential mineral used to build bones and teeth and to maintain bone strength. It is also necessary for muscle contraction, blood clotting, and the maintenance of all cell membranes. Osteoporosis, a condition in which bone mass is decreased, may be related to a long-term low calcium intake. However, several other factors such as age, sex, body weight, hormone use, and physical activity also influence the development of this bone disorder. Osteoporosis is most common among elderly white females.

The Recommended Dietary Allowance (RDA) for calcium is 800 mg per day for adults and young children and 1,200 mg per day for adolescents. The calcium level of the U.S. food supply was 924 mg

Calcium in the U.S. Food Supply

Figure 1A. Calcium Levels Reached a Peak in the Mid-1940's

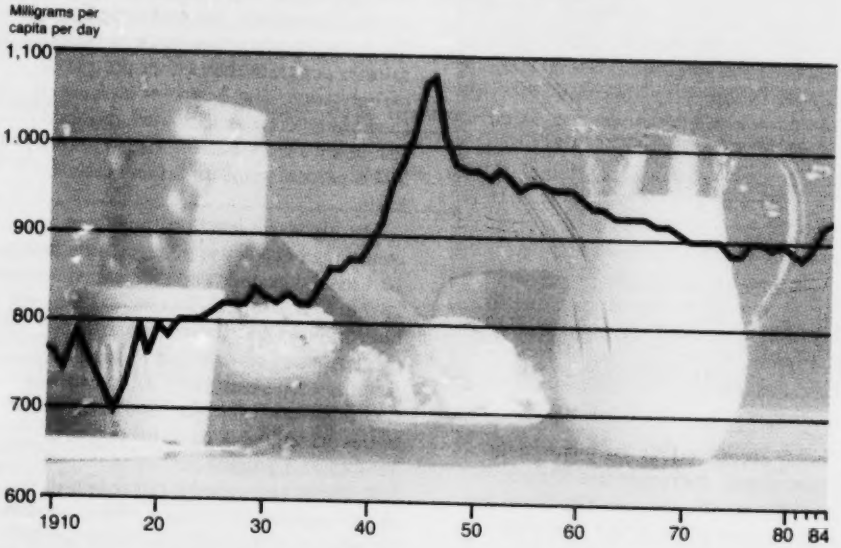
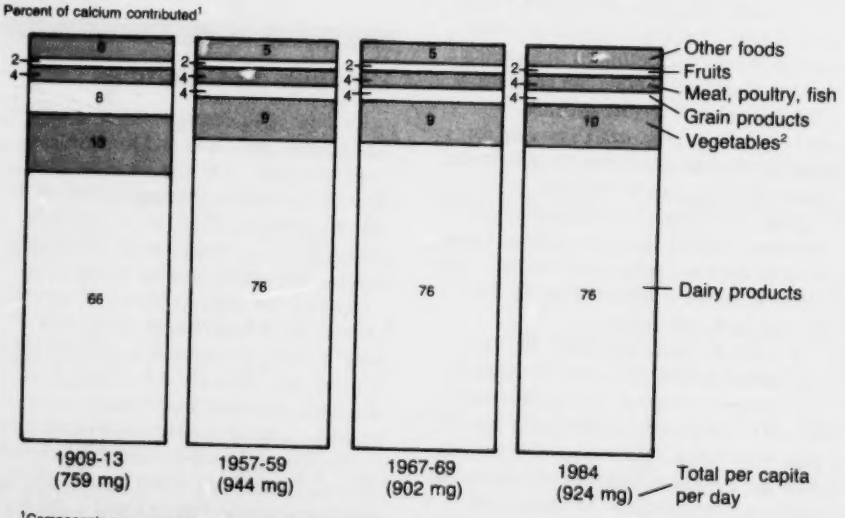


Figure 1B. Dairy Products Are the Largest Source of Calcium in the Food Supply



[1]Components may not add exactly to 100% due to rounding.
[2]Vegetables, potatoes, and dried beans, peas, nuts, and soy products.

per capita per day in 1984, higher than the 759 mg in 1909-13 but lower than the peak of 1,075 mg in 1946 *(figure 1A)*.

Although the per capita level of calcium in the food supply in 1984 appears to be sufficient since it is near RDA levels, such a conclusion may be erroneous for several reasons. First, estimates of nutrients in the food supply may overstate actual intake because they are based on foods available for consumption, rather than on what is actually eaten. These estimates don't account for nutrient losses which occur in processing, marketing, or home use. The RDA's, in contrast, indicate the amounts of nutrients to be obtained from foods actually ingested.

Second, estimates of per capita nutrient levels in the food supply do not take into consideration differences in the distribution of food among individuals in the population. Food is not distributed equally among individuals, nor is it necessarily distributed on the basis of nutritional need.

USDA's Nationwide Food Consumption Survey, 1977-78, and Continuing Survey of Food Intake by Individuals, 1985, measured calcium as ingested by individuals. Findings indicate that average calcium intakes were below the RDA for several sex and age categories. For example, in a national sample in 1985, women 19 to 50 years old had average intakes of 78 percent of the RDA.

Calcium from Dairy Products Increased

The amount of calcium from dairy products increased from 503 to 700 mg per capita per day between 1909-13 and 1984. The proportion of the total calcium in the food supply provided by dairy products also rose from 66 to 76 percent *(figure 1B)*. Because such a large proportion of calcium is provided by dairy products, the calcium level in the food supply closely followed trends in use of these foods. The dairy product group has six categories—whole milk, skim and lowfat milk and yogurt, cream, cheese, canned and dry milk and whey, and frozen desserts.

Among the dairy products, whole milk was the leading source of calcium throughout the century. However, the contribution of calcium from whole milk declined from 65 percent in 1909-13 to 57 percent in 1957-59 and to only 28 percent in 1984 *(figure 2A)*. Use of whole milk peaked at 342 pounds per capita in 1945 and declined to its lowest level of 125 pounds in 1984. Reasons for decreased use of whole milk include a declining proportion of young children in the population, substitution of lowfat and skim milk for whole milk, and increased use of other beverages such as soft drinks.

In contrast, the category comprised of skim, plain and flavored lowfat milk, buttermilk, and yogurt contributed 23 percent of the calcium from dairy products in 1984, compared with 19 percent in 1909-13 and only 5 percent in 1957-59. Use of products in this category declined throughout the first half of the century to a record low of 24.3 pounds per capita in 1958. However, use increased substantially over the last 25 years, reaching 106.5 pounds in 1984. This upward trend was probably related to increased consumer interest in avoiding excess calories and fat in the diet.

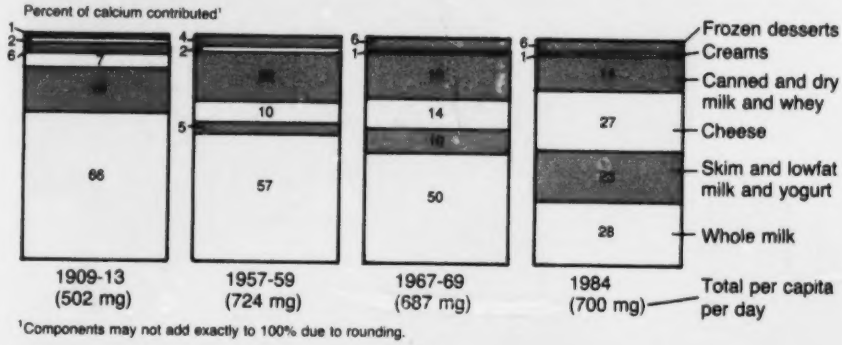
Skim milk made the largest contribution to calcium from this category in 1954, providing 61 percent of the total calcium coming from the skim and lowfat milk and yogurt group. By 1984, the share from skim milk had declined to only 12 percent *(figure 2B)*. Data on use of specific types of skim and lowfat milk and yogurt are available only since 1954.

The percentage of calcium from buttermilk declined over the past 30 years, providing only 4 percent in 1984 compared with 28 percent in 1954. Despite a small increase in use of flavored lowfat milk between 1954 and 1984, the proportion of calcium provided declined by half to 5 percent in 1984 because of larger increases in use of other foods.

In 1984, 1- and 2-percent lowfat milk was the major source of calcium providing 75 percent of the total from the skim and lowfat category compared with 1 per-

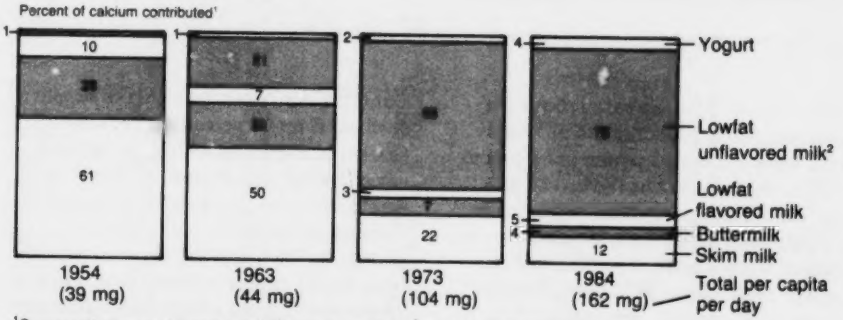
Calcium in Dairy Products

Figure 2A. Whole Milk Now Supplies Less Than 30% of the Calcium Provided by Dairy Products



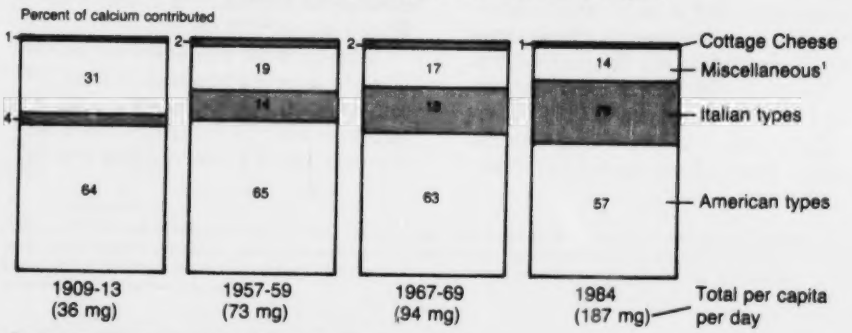
[1]Components may not add exactly to 100% due to rounding.

Figure 2B. Lowfat Replaces Skim as the Major Calcium Source in the Skim, Lowfat, and Yogurt Group



[1]Components may not add exactly to 100% due to rounding. [2]One and two-percent lowfat milk.

Figure 2C. American Types Still Dominate the Cheese Category



[1]Swiss, brick, muenster, cream, blue, brie, edam, gouda, feta, and tilsit.

Calcium from cheese doubled between the late 1960's and 1984.

cent in 1954. This increase reflects the dramatic rise in consumption of lowfat milk from less than 1 pound per capita in 1954 to 80.3 pounds in 1984. The proportion of calcium supplied by yogurt in the skim and lowfat milk category also increased from 1 percent in 1963 to 4 percent in 1984. Since 1971, use of yogurt tripled to 3.5 pounds per capita.

Cheese provided a little more than one-fourth of the calcium from dairy products in 1984, ranking second to whole milk. The share of calcium from dairy products provided by cheese almost doubled between 1967-69 and 1984. Use of American-type cheese more than doubled over the period and in 1984 was the major source of calcium from the cheese group. However, the proportion of calcium that American-type cheese supplied declined from 65 percent in 1957-59 to 57 percent in 1984 *(figure 2C)*. In contrast, use of Italian-type cheese, primarily mozzarella for pizza, increased from less than 1 pound per capita in 1957-59 to 5.8 pounds in 1984, and the share of calcium from Italian cheese doubled from 14 to 28 percent. Calcium from miscellaneous cheeses declined steadily throughout the years, providing 31 percent in 1909-13 and 14 percent in 1984. Cottage cheese consistently provided 1 to 2 percent of the calcium from all cheese.

Canned and dry milk and whey provided 14 percent of the calcium from dairy products in 1984, down from 22 percent in 1957-59, mainly reflecting the decline in use of nonfat dry milk after the early 1960's. Nonfat dry milk provided less than half as much calcium in 1984 as in 1960. In contrast, the amount of calcium from dry whey, an economical substitute for nonfat dry milk in processed foods, more than tripled between 1970 and 1984.

The desserts category includes ice cream and other frozen milk-based desserts. Calcium in the dairy product group provided by these foods increased from 1 to 6 percent between 1909-13 and 1967-69. In contrast, during that period the proportion of calcium from creams decreased from 2 to 1 percent. However, after 1967-69, little change occurred in the proportions from either frozen desserts or cream.

Other Foods Also Provide Calcium

Although the dairy products group is the main source of calcium in the U.S. food supply, other foods also contribute. Vegetables (including potatoes and sweetpotatoes) and dry beans, peas, nuts, and soy products together provided the largest proportion of calcium from nondairy foods. However, their proportionate contribution declined during the century primarily because of decreased use of potatoes, dry beans, and peas. Greater use of dark green and deep yellow vegetables, tomatoes, peanuts, and soy products offset some of the decline.

The proportion of calcium from grain products was halved from 8 percent to 4 percent between 1909-13 and 1957-59 and remained at about this level. Meat, poultry, and fish provided about 4 percent and fruits about 2 percent of the calcium in the food supply throughout the years. Eggs, fats and oils, sugar and sweeteners, and miscellaneous products such as coffee, tea, cocoa, and spices provided 5 or 6 percent of the calcium since 1909-13. □

Food Prices Post Small Rise

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Retail food prices rose only 2.3 percent in 1985, the second smallest increase in 18 years. A decline in the farm value of food helped slow the increase in retail food prices. Grocery store food prices were up an average of less than 1.4 percent from 1984, while the cost of meals sold in restaurants and fast food establishments rose 4 percent *(table 1).*

A 5.3-percent increase in the farm-to-retail spread was the main reason for last year's rise in retail food prices. This spread is the difference between farm value and retail price, and it represents what the food industries charge for processing raw farm products into finished foods and transporting and distributing them to consumers.

Increases in the spread usually occur as rising costs for labor and other inputs used by the food industry are passed on to consumers through higher retail food prices. Compared with many past years, however, the 1985 rise in food marketing costs was very modest. It was held in check mostly because the food industry's hourly labor costs were unchanged, compared with increases of about 3 percent in 1984 and 4 percent in 1983. Thus, the 1985 increase in the farm-to-retail spread only partly reflected higher food marketing costs; it also reflected lags by the food industry in passing the farm value declines through to retail prices. While the wider spread in 1985 suggests some recovery in food industry profits following the recession of the early 1980's, greater amounts of advertising and promotion boosted operating costs of some firms and held down profit margins to near 1984 levels.

Consumer demand for foods remained strong in 1985, a carryover from 1984. In 1984, a rise in the rate of growth in the general economy and a 5.8-percent increase (after adjusting for inflation) in disposable personal income contributed to increases in food demand. In 1985, disposable personal income increased less than 2 percent, and the unemployment rate fell to 7.2 percent, down slightly from 1984's 7.5 percent.

Farm Share Declines for Most Foods

The farm value of food, that part of the consumer's food dollar that goes to farmers, dropped 6.9 percent in 1985. Large supplies of many commodities, particularly beef, pork, and poultry, depressed farm prices and held down increases in retail prices.

Crop and livestock production, which climbed sharply in 1984, was up again last year. Soybean production, for example, rose about 14 percent, resulting in large supplies and lower oilseed prices despite strong demand for vegetable oils. The farm value of vegetable oil products dropped 16 percent. The farm value of crop products as a whole fell 5 percent.

Large supplies of meat and poultry depressed producer prices for cattle and

Table 1. Tracking the Food Price Index

Year	All food	Food at home			Food away from home	CPI[2] all items
		Total	Domestically produced farm food	Nonfarm food[1]		
	Percentage change					
1960	1.0	0.9	0.5	—	2.6	1.6
1961	1.3	.9	.3	—	2.2	1.0
1962	.9	.7	1.0	—	2.6	1.1
1963	1.4	1.3	−.2	—	2.2	1.2
1964	1.3	1.1	.2	—	1.8	1.3
1965	2.2	2.5	2.8	—	2.2	1.7
1966	5.0	5.0	5.3	—	4.6	2.9
1967	.9	−.3	−1.0	—	5.2	2.9
1968	3.6	3.2	3.6	0	5.2	4.2
1969	5.1	4.8	5.3	.9	6.1	5.4
1970	5.5	5.1	4.2	12.7	7.4	5.9
1971	3.0	2.4	1.8	7.2	5.2	4.3
1972	4.3	4.5	4.8	1.7	4.0	3.3
1973	14.5	16.3	17.3	8.9	7.9	6.2
1974	14.4	14.9	13.8	23.8	12.7	11.0
1975	8.5	8.3	7.2	16.7	9.3	9.1
1976	3.1	2.1	1.0	9.8	6.8	5.8
1977	6.3	6.0	2.2	31.3	7.6	6.5
1978	10.0	10.5	11.3	7.4	9.0	7.7
1979	10.9	10.8	11.7	6.6	11.2	11.3
1980	8.6	8.0	7.2	11.7	9.9	13.5
1981	7.9	7.3	7.7	5.8	9.0	10.4
1982	4.0	3.4	3.6	2.7	5.3	6.1
1983	2.1	1.1	.9	1.9	4.4	3.2
1984	3.8	3.7	3.9	2.6	4.2	4.3
1985	2.3	1.4	1.2	2.6	4.0	3.6

— = Not available

[1]Includes soft drinks, coffee, and other nonalcoholic beverages, fish and seafood, candy and chewing gum, imported sugar, seasonings, and bananas. Data were estimated for 1968 through 1978 based upon the relative importance of these foods in the total food-at-home index and the price changes for domestic food and food at home. [2]Consumer Price Index, all urban consumers.

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hogs. Red meat's farm value, which accounts for about two-fifths of the total farm value of USDA's market basket of foods, averaged 8 percent lower.

Poultry producers increased production last year in response to lower feed prices and expectations of better returns. Farm value fell 6 percent for poultry. Egg and fresh vegetable supplies remained near 1984 levels but their farm prices fell, also contributing significantly to the overall drop in farm value.

Research indicates that it requires an average of 3 months or longer for the full effect of price changes at the farm level to be reflected at retail. The actual adjustment period varies by commodity, the amount of processing, and stock levels. Partly because of the time lag required for price changes to pass through the marketing system, lower farm prices for some foods in 1985 were not fully reflected at the retail level.

Cattle prices, for example, declined more than retail beef prices in 1985. Heavier slaughter weights of cattle caused larger beef supplies and lower fed cattle prices. Meat packers also discounted prices paid for heavier cattle to reflect the additional cost of more trimming and other handling activities.

Not all commodities saw lower farm values in 1985. Smaller supplies raised prices for processed fruits and vegetables.

Last year's farm value decline followed 1984's 5.4-percent rise—the largest increase since 1979. A relatively stable farm value since 1980 has slowed the rise in retail food prices *(figure 1)*. Retail food prices in grocery stores rose 21.7 percent from 1980 through 1985, less than the 30.5-percent increase for all items in the Consumer Price Index (CPI).

In 1981, very large crop production and expanding meat supplies limited the rise in farm value to under 3 percent. As a result, retail food prices went up much less than inflation. In 1982, crop harvests were large again. While meat production declined slightly, there was virtually no increase in the farm value because domestic and foreign demand for agricultural commodities was weaker during the long recession. In 1983, the farm value declined because of a substantial increase in livestock production, particularly hogs, and continued large supplies and weak demand for most food commodities.

The farm value of food has not kept pace with prices paid by farmers for production items. Since 1980, the farm value has declined about 1 percent, compared with an increase of 14 percent in the cost of production inputs, a disparity that has contributed to depressed farm income during the past several years.

For most foods, farm value makes up a relatively small part of the retail price. The farm value as a share of the retail price varies depending on the inputs used and the complexities of the marketing process. In general, animal products have the highest ratios of farm value to retail prices, and the more highly processed crop products have the lowest. Last year, the farm value share of the retail price for major foods ranged from 10 percent for cereal and bakery products to 60 percent for eggs.

The farmer's share of the consumer food dollar averaged 31 cents last year, down from 34 cents in 1984. Farm value's share of the retail cost of food has trended down gradually since the mid-1940's, when it was nearly 50 percent.

Larger Share Goes for Marketing

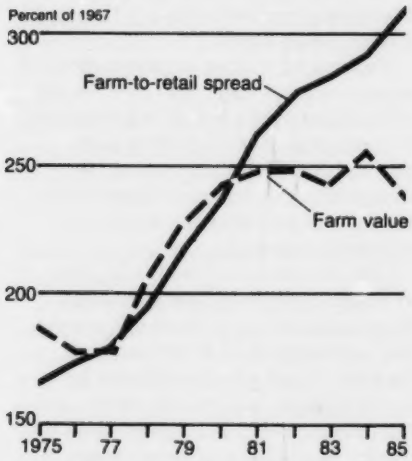
The difference between farm value and the retail price, called the farm-to-retail spread, increased 5.3 percent in 1985. This is the largest rise in 3 years. The farm-to-retail spread represents all processing, transporting, and retailing charges added to the value of farm products after they leave the farm.

A wider spread may at least partially reflect rising costs faced by food industry firms, including wages of workers and prices of the many inputs bought from other parts of the economy.

USDA's Food Marketing Cost Index (FMCI) measures price changes in the factors affecting the farm-to-retail spread, such as labor, energy, packaging, and transportation. The FMCI rose less than

Lower prices of many commodities, including fresh vegetables, contributed to the overall drop in farm value.

Figure 1. Food Marketing Charges Outpace Farm Value



Farm value represents prices received by farmers for commodities equivalent to a fixed market basket of foods. Price spread is the difference between farm value and retail cost of the market basket and represents all charges for processing and distribution.

1 percent in 1985, compared with 4.2 percent in 1984 and 2.8 percent in 1983 *(table 2)*.

The small rise in the FMCI was mainly the result of unchanged average hourly labor costs. Labor costs, consisting of hourly earnings of production and nonsupervisory workers and employee benefits, represent almost half of the FMCI. The next largest input, containers and packaging, is only about one-third as large, comprising about 15 percent of the marketing cost index.

For the food retailing sector of the industry, the labor cost index actually fell by about 3.5 percent in 1985. The decline resulted in large part because of the weakness of the labor market. Several other factors have also moderated retailing labor costs, including the trend in recent years toward "multi-tiered" labor contracts that pay new workers significantly less than existing employees. For instance, newly hired clerks may earn a starting wage of $5 per hour and be able to advance to $8.50. In contrast, existing workers may have been hired at $6.50 per hour and can earn as much as $11.

Many of the union contract settlements in the past 2 years did not provide for any wage increase during the first year of the contract, and only small increases were negotiated for the ensuing years. Moreover, there have been reductions in several areas, including overtime pay rates, cost-of-living adjustments, and holiday and sick day benefits. Lump-sum payments have been granted to some workers in lieu of wage increases to eliminate the added cost of some benefits that are based on wage rates. Some companies have closed stores that were paying union wages and while many of these stores were reopened, worker pay scales were lower.

Labor costs for food wholesaling rose 3.4 percent in 1985, compared with 5.1 percent a year earlier. In food manufacturing, labor costs averaged 2.2 percent higher last year. This increase was only about half as large as in 1984.

In total, labor costs for food are likely to rise only moderately in 1986, helping to hold down the increase in food prices. The multi-tiered pay scale will continue to temper labor costs in food retailing, while the same economic environment that has prevailed for several years is likely to continue. Inflation should remain at 3.5 to 4.0 percent, curtailing wage increases. Concern among workers over job security and continued unemployment in the economy will also dampen worker demands for wage increases.

Packaging Costs Increased in 1985

The price of packaging and container materials used by the food industry averaged 0.2 percent higher in 1985 than a year earlier, reflecting a 4.3-percent rise in the price of tin cans and a 5.3-percent increase for glass. Most affected were companies manufacturing canned fruits and vegetables, fish products, and soft drinks.

Prices of tin and glass containers in 1986 are likely to rise at close to last year's rate. Increases in steel prices, along with labor cost pressures, will mainly determine price increases for tin cans. Prices for glass containers are

Table 2. Measuring Price Changes in Food Marketing Inputs[1]

Cost Item	1980	1981	1982	1983	1984	1985[2]
	Annual percentage change					
Labor[3]	10.1	9.8	6.7	4.1	2.9	0
Packaging materials	14.4	7.5	-2.0	2.0	9.6	0.2
Paperboard boxes and containers	16.1	10.0	-1.3	-1.5	12.0	-2.2
Metal cans	11.2	6.2	5.1	2.9	6.1	4.3
Transportation	18.5	16.1	7.3	.9	4.4	.8
Fuels and electricity	34.9	18.7	5.4	0	1.1	-1.8
Electricity	18.4	14.9	10.4	2.9	5.3	3.1
Petroleum	48.1	24.1	-4.1	-11.5	-1.7	-6.7
Natural gas	34.7	12.6	19.8	16.6	.7	-0.6
Maintenance and repair	11.0	9.7	6.9	4.0	3.6	2.8
Supplies	15.4	9.7	1.9	-.9	.6	-0.2
Interest, short term	12.6	20.2	-19.5	-25.2	14.0	-20.8
Total marketing cost index (FMCI)	13.5	10.9	5.1	2.8	4.2	0.6

[1]Data measure changes in prices for fixed quantities of labor and other inputs used in processing, wholesaling, and retailing farm foods sold through foodstores. [2]Preliminary. [3]Hourly earnings and benefits.

Understanding Food Price Changes

USDA uses a fixed set of foods representing consumer purchases to track changes in the prices of domestically produced foods sold in grocery stores. These market basket data account for about 82 percent of food at home, with prices for fish, nonalcoholic beverages, and imported products making up the remainder.

The cost of the market basket is divided into two components—the farm value and the farm-to-retail spread, which accounts for all charges for processing and distributing foods to consumers, including profits to the food industry.

The farm value of food is determined by the prices farmers receive for commodities and reflects supplies. ERS analysts calculate it by multiplying farm prices by the quantities of farm products equivalent to foods sold at retail. An allowance is made if byproducts are obtained in processing. The farm value is based on the quantity equivalent to a retail unit. Thus, the farm value is computed from a larger quantity than the retail unit because the foods farmers produce lose some weight in storage, processing, and distribution.

The farm product equivalent varies among foods. Only a slight amount of raw milk is lost, for example, as it is handled and processed for sale in cartons to consumers. Therefore, the price that milk producers receive per half-gallon at the farm is a little less than the farm value of the retail price per half-gallon at the store. In contrast, nearly 2.4 pounds of live animal are needed to yield 1 pound of Choice beef at the meat counter. The payment the cattle producer receives for that larger quantity of live animal is the farm value in the price of 1 pound of retail beef.

The second component of food price change, the farm-to-retail spread, is more closely related to the inflation rate and prices of inputs used in food processing and distribution, such as labor, energy, and transportation.

USDA's Economic Research Service developed a food marketing cost index (FMCI) for monitoring and analyzing changes in labor costs and prices of other inputs to food processing and distribution. The FMCI measures price changes for supplies and services used in processing, wholesaling, and food store retailing of domestically produced foods. It does not cover input prices for doing business at eating places, however. The FMCI represents all nonfarm food marketing costs except depreciation of buildings and equipment, long-term interest, and profits.

Prices in the index are weighted by the quantities used in 1972. The purpose is to ensure that price changes of individual input items have the same relative effect on the index proportionate to the use of each input by the food industry. Labor, for instance, is weighted far more heavily than packaging materials because of the food industry's proportionately greater dependence on and costs for labor.

expected to follow those of tin cans.

Prices of paperboard products, such as corrugated boxes used to ship most food products, averaged 2.2 percent lower than a year earlier. Price changes for paperboard packaging have been erratic in recent years, declining about 3 percent during the 1982-83 recession but rising 12 percent during the 1984 economic recovery. Prices are expected to increase 3 to 4 percent in 1986 because the industry has held off adding production capacity and the decline in the value of the dollar may strengthen foreign demand for U.S. paperboard products.

Transportation Costs Up, Energy Prices Down

Transportation costs represent about 11 percent of marketing costs. In 1985, the railroad freight rate index for food products averaged only 0.8 percent higher than in 1984. Rates are expected to change little this year since demand for and costs of providing rail services are unlikely to increase.

Less than half of all foodstuffs, however, are transported by rail. A larger share, especially fresh fruits and vegetables, are transported by independent truckers. Truck rates are affected by prices of diesel fuel, drivers' wages, and the financing costs and depreciation of trucks. In 1985, it cost independent truckers an average of $1.16 per mile to operate their vehicles, up less than 1 cent from a year earlier. Costs went up mainly because of much higher insurance costs and a highway fee imposed on vehicles weighing more than 55,000 pounds. Costs are expected to rise little in 1986 because of competition for freight by a growing number of truckers.

Energy represents about 9 percent of the cost of marketing food. The energy costs index, a combined index of fuels and electricity, has been relatively unchanged since 1982. The index averaged 1.8 percent lower last year than in 1984.

Prices of diesel fuel and fuel oil fell about 7 percent, reflecting plentiful stocks and lower world prices for crude oil. Continuing large supplies of oil will weaken the OPEC cartel and exert downward pressure on petroleum product prices in the coming year.

Prices of natural gas and liquid propane gas, the principal energy sources for food processing, were virtually unchanged in 1985. Increases in natural gas prices in 1986 are expected to be below the inflation rate. Moreover, no substantial

changes in natural gas prices are anticipated from the partial deregulation that went into effect in January 1985.

Electricity for operating refrigeration equipment and store lighting account for over two-thirds of food retailing energy costs. Electricity rates were up about 3 percent in 1985 and probably will rise by about the same percentage in 1986. As a result, increases in energy costs are not likely to have a major effect on food prices in 1986.

Profit Margins Important Part of Food Prices

Although not included in the Food Marketing Cost Index, profits are an important element of food prices. Profit margins of food chains typically average between 1.5 and 2 cents per dollar of sales before taxes, and slightly over 1 cent after taxes. The profit margin of food manufacturers is higher, averaging about 5 cents per sales dollar before taxes and over 3 cents after taxes. The higher margin reflects their large capital investment and slower inventory turnover. Food manufacturers' profit margins were nearly stable throughout 1984 and the first 9 months of 1985. Food manufacturers' profits after taxes averaged 3.2 percent of sales in the first 9 months of 1985, unchanged from a year earlier.

Food chain profits declined, averaging 1.2 percent of after-tax sales, compared with 1.3 percent in 1984 when they were much higher than in other years of the last decade. The higher 1984 profits could be attributed to a slower rise in labor costs, increased sales of nonfood products which have higher markups than foods, and more large stores that were able to spread fixed costs (costs that don't vary with output, such as for the plant or insurance) over a greater sales volume.

Food industry profits this year are likely to be close to last year's since raw material and labor costs are not expected to significantly increase, and consumer food spending should continue to rise.

Retail food prices are expected to rise 2% to 4% this year after increasing only 2.3% in 1985.

Outlook for 1986

This year will be a time of adjustment in production and prices for the food industry. Supplies will continue to be ample but more in line with consumer demand.

Food prices are expected to rise 2 to 4 percent above 1985, based on a likely rise of 1 to 3 percent at the grocery store and 3 to 5 percent for meals eaten away from home.

Higher farm prices for meat animals and eggs will raise the farm value of food 1 to 3 percent and will account for about a third of the total increase in food prices. Fewer marketings and higher farm prices for cattle and hogs are expected to raise the farm value of meat about 7 to 9 percent in 1986. The farm value of eggs also is expected to increase, while most other commodities are expected to remain near or slightly below 1985.

The farm-to-retail price spread is expected to increase 2 to 4 percent, accounting for nearly half of the rise in food prices. The higher farm value and increased prices for fish and imported foods will account for the rest.

A look at individual commodities shows that prices of meat are expected to increase from 2 to 4 percent above 1985 because of reduced production and smaller but ample supplies. Beef and pork prices are both forecast to rise within that range. Poultry prices are forecast to remain unchanged or fall slightly as production increases. Strong demand will likely hold prices near 1985 levels as consumers substitute chicken and turkey for the relatively higher priced red meats. Fresh vegetable prices are expected to fall 4 to 6 percent below 1985 because of large supplies, particularly potatoes. Fresh fruit prices will likely rise 5 to 7 percent in 1986, with the largest increases coming in the second and third quarters of the year. Most other food categories are forecast to rise 2 to 4 percent. □

Projected Growth in American Food Spending

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Today's rapidly changing economic and social environment challenges the producers and marketers of America's agricultural products. Slower population growth, changing age distribution, regional migration, increased longevity, and altered employment patterns are a few significant demographic trends facing the food sector over the next several decades.

A recent ERS report indicates that, despite these changes, the rate of growth in national food expenditures through 1995 may not be much different from the rate for 1965-80. However, two factors—higher incomes and an older population—could mean significant shifts in expenditures among food groups. For example, an aging population alone may mean a 2-percent increase in per capita expenditures for fish by 1995, compared with spending increases of 1.2 percent for beef and 3.1 percent for poultry. The projected 2-percent annual growth in income would boost spending for fish by 12.6 percent versus 7.7 percent for beef and 5.0 percent for pork. Combining population growth with the aging of the population and income growth means expenditures at the national level could increase by almost 31.9 percent for fish, 24.4 percent for beef, and 22.1 percent for poultry between 1980 and 1995.

The ERS study reveals that the effects of changes in income and demographic composition could be almost exactly offset by the slowdown in the population growth rate, leaving total and at-home food spending in 1980-95 growing at the same pace as over the 1965-80 period. During those years, food expenditures rose 29.3 percent, while food-at-home saw a 23.3-percent increase. The ERS projections indicate that, from 1980-95, total food expenditures may rise 29 percent and at-home spending about 24 percent.

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Forces Behind Changing Demand

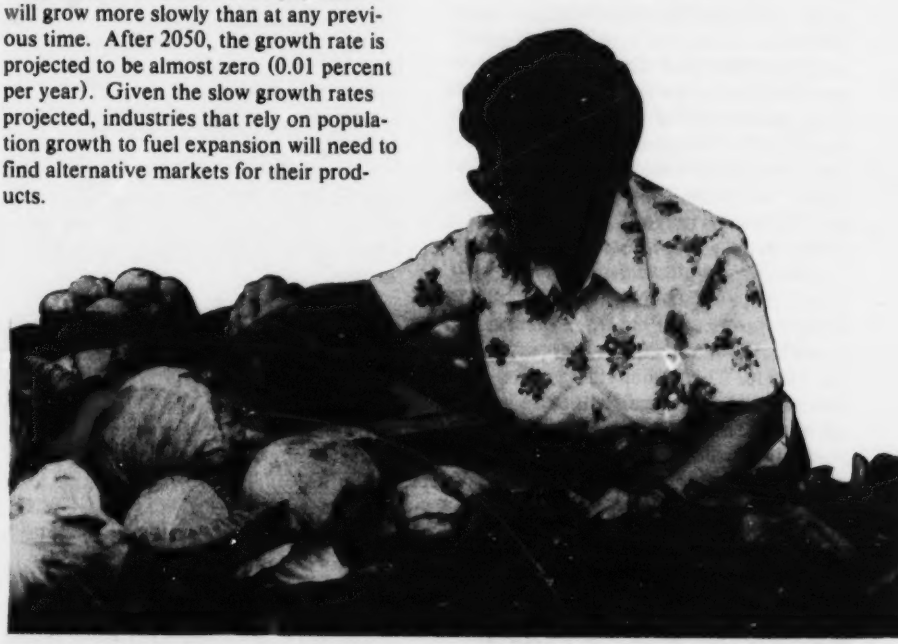
The ERS study combined an econometric model of consumer food demand with estimates by the Bureau of the Census on population and income growth trends over the next several decades.

The two most significant demographic changes affecting consumer food demand will be the slowing of the overall population growth rate and the subsequent aging of the population. For example, the U.S. population grew from 152.2 million in 1950 to 227.7 million in 1980, a 50-percent increase. However, from 1980 to 2010, the Census Bureau projects that the population may increase by 55.5 million, only 24 percent. (Census projections actually show a range of estimates, but ERS used the midpoint estimate in its study).

Furthermore, from 2010 to 2040, the population may only increase an estimated 9 percent. These figures imply that, from 1980 to 2040, the population will grow more slowly than at any previous time. After 2050, the growth rate is projected to be almost zero (0.01 percent per year). Given the slow growth rates projected, industries that rely on population growth to fuel expansion will need to find alternative markets for their products.

Slower growth will also mean an older population. To illustrate, the median age of the U.S. population in 1983 was at a record-high 30.9 years. (The median age, which means that exactly half the population is older and half younger, is often used as a measure of the age of the population). According to the Census Bureau, the median age will reach 36.3 years at the turn of the century, 40.8 years in 2030, and 42.8 years in 2080.

These increases in the median age of the American population signal important changes in the age distribution. For example, those 65 or older made up 8.5 percent of the population in 1950, 10.5 percent in 1970, and 12.3 percent in 1980. They are projected to account for 14.0 percent of the population in 1990, 16.2 percent in 2010, and 27.3 percent by 2050. The percentage of the population under 35 is projected to decline far into



Older households tend to buy more fresh fruits and vegetables.

the next century, while the opposite is true for those 35 and over.

An Older Population Will Change Food Demand

As we age, we tend to change our food buying habits. The Bureau of Labor Statistic's Consumer Expenditure Survey reveals, for example, that older households tend to buy more fresh fruits and vegetables but less food away from home and less alcoholic beverages.

The ERS projections of the impact a changing age distribution will have on future per capita food expenditures assume that all other demographic factors, relative prices, and income remain constant at 1980 levels.

An older population is expected to generate steady increases in all per capita food expenditure groups from 1980 to 2020, except away-from-home eating and alcoholic beverages. Per capita expenditures are projected to decline 3.9 percent for food away from home and 5.8 percent for alcoholic beverages. The declines can be attributed to the projected increase in the percentage of the population over age 64, who spend less on these items than younger groups.

Per capita spending on total food is expected to rise just 2.2 percent, while expenditures on food at home are projected to increase 5.2 percent between 1980 and 2020 *(table 1)*. At-home expenditures for meat, poultry, fish, and eggs together may rise 6.4 percent; spending for fruit is projected to increase 7.2 percent; vegetables, 6.7 percent; and fats and oils, 6.2 percent. The groups least affected will be dairy products (up just 2.9 percent) and miscellaneous foods (up 0.7 percent).

Items most affected by the projected changes in the age distribution will be pork, up 8.3 percent from 1980 to 2020; poultry, up 7.6 percent; fresh fruits, up 8.2 percent; fresh vegetables, up 7.8 percent; and margarine, up 10.3 percent. Expenditures for milk and cream will be least affected, rising only 2.1 percent. Cheese will likely increase 3.1 percent; other dairy products, 3.6 percent; and butter, 3.3 percent.

Table 1. How an Aging Population Might Affect Per Capita Food Spending

	1995	2000	2010	2020
		1980=100		
Total food	100.9	101.2	102.0	102.2
Food away from home	99.0	98.4	98.9	98.1
Food at home	101.7	102.6	104.5	105.2
Meat, poultry, fish, eggs	102.1	103.2	105.7	106.4
Beef	101.2	102.0	103.9	104.2
Pork	102.8	104.1	107.0	108.3
Other meat	101.7	102.5	104.3	105.1
Poultry	103.1	104.1	106.6	107.6
Fish	102.0	102.9	104.6	105.2
Eggs	102.1	103.1	105.4	106.2
Cereal and bakery products	101.4	102.3	103.7	104.5
Dairy products	101.1	101.6	102.6	102.9
Milk and cream	100.3	100.9	101.9	102.1
Cheese	101.6	101.9	102.6	103.1
Other dairy products	101.5	102.1	102.8	103.6
Fruits	102.1	102.9	105.4	107.2
Fresh	102.3	103.2	106.0	108.2
Processed	101.9	102.5	104.2	105.2
Vegetables	102.4	103.3	105.5	106.7
Fresh	102.8	103.7	106.2	107.8
Processed	101.9	102.7	104.4	105.2
Sugar and sweeteners	101.2	101.7	102.7	104.1
Nonalcoholic beverages	101.7	102.5	103.9	103.9
Fats and oils	102.2	103.1	105.1	106.2
Butter	101.6	101.8	102.3	103.3
Margarine	103.7	105.2	108.2	110.3
Other	101.3	102.2	103.9	104.8
Miscellaneous foods	100.1	100.0	100.4	100.7
Alcoholic beverages	98.3	97.4	96.0	94.2

Rising Incomes Could Boost Food Demand

While an older population would mean changes in demand, income growth will also boost food spending. The ERS economists assumed that real (adjusted for inflation) consumer purchasing power would grow 2 percent annually, a rate on par with the 1960-1980 period.

Projections from 1980 to 2020 show that per capita expenditures could increase for all commodities, except eggs which may decline slightly after 1985. By 2020, total food expenditures per capita are projected to increase 36.9 percent, but away-from-home food expenditures could rise 66.8 percent *(table 2)*. At the same time, food-at-home outlays may rise only 18.7 percent.

Commodities projected to be most responsive to income growth between 1980 and 2020 include fish, up 37 per-

A Cautionary Note on Assumptions

The development of projections is a complex task involving numerous assumptions. Economists Smallwood and Blaylock based their projections on the assumption that changes in income and population would have the same impact in 2020 as they did in 1980. In the income projections, for example, it is assumed that consumers of a given income level will spend an additional dollar of income on the same products between now and 2020 as they spent in 1980.

Furthermore, the authors assumed that price relationships among food products would remain the same. That is, the retail price difference between beef and poultry, for instance, would be comparable in both 1980 and 2020. Alternative opportunities for food choices, as well as tastes and preferences, were also assumed to remain unchanged over the study period.

As the population changes over time, consumers are assumed to acquire the food expenditure patterns of individuals already in those circumstances. For example, a 25-year-old in 2020 has the same food expenditure patterns as a 25-year-old in 1980. Also, the projections represent national averages for food-at-home spending and may not adequately reflect trends in any particular region.

cent; cheese, up 27.6 percent; and alcoholic beverages, up 74.4 percent. Milk and cream and margarine show the smallest expected changes in response to higher incomes.

The projected change in per capita expenditures is not the same for each 10-year interval, even though income growth is assumed to be constant. For example, away-from-home food expenditures per

Table 2. How Higher Incomes Might Affect Per Capita Food Spending

	1995	2000	2010	2020
			1980=100	
Total food	111.8	116.3	126.2	136.9
Food away from home	119.7	127.7	145.8	166.8
Food at home	106.6	109.0	114.0	118.7
Meat, poultry, fish, eggs	107.1	109.6	114.7	119.2
Beef	107.7	110.5	116.3	121.8
Pork	105.0	106.6	109.5	111.2
Other meat	105.9	107.9	111.5	114.0
Poultry	103.0	103.8	104.7	103.9
Fish	112.6	117.3	127.2	137.0
Eggs	99.8	99.6	99.0	97.6
Cereal and bakery products	105.1	106.8	110.0	112.4
Dairy products	104.5	106.1	109.3	112.3
Milk and cream	100.7	100.9	101.4	101.9
Cheese	110.3	114.0	121.3	127.6
Other dairy products	106.9	109.3	114.4	119.2
Fruits	107.1	110.1	117.3	126.7
Fresh	107.1	110.4	118.6	130.1
Processed	107.3	109.9	115.3	120.4
Vegetables	107.9	110.7	116.2	121.1
Fresh	108.1	111.0	116.9	122.3
Processed	107.1	109.6	114.1	117.3
Sugar and sweeteners	105.1	106.7	109.4	110.7
Nonalcoholic beverages	104.0	105.5	108.3	110.9
Fats and oils	105.8	107.8	111.8	115.0
Butter	111.7	116.1	125.4	134.4
Margarine	102.1	102.6	102.5	100.6
Other	104.6	106.2	109.4	112.0
Miscellaneous foods	108.1	111.0	116.8	122.0
Alcoholic beverages	120.2	128.7	149.0	174.4

capita are projected to increase by 27.7 percent between 1980 and 2000 and 39.1 percent from 2000 to 2020. This is primarily because of the compounding effect of income growth. Higher income will generate increased per capita expenditures for all but a few commodities, so most of the agricultural sector benefits from higher rates of economic growth.

Table 3. How Population and Income Combined Might Affect National Food Spending

	1995	2000	2010	2020
		1980=100		
Total food	129.0	138.9	160.0	181.8
Food away from home	135.9	148.9	177.8	212.2
Food at home	123.9	131.7	147.7	161.7
Meat, poultry, fish, eggs	124.9	133.2	150.2	164.1
Beef	124.4	132.7	149.9	164.9
Pork	123.6	131.2	146.3	157.2
Other meat	121.3	127.9	140.6	150.1
Poultry	122.1	128.4	140.6	148.0
Fish	131.9	143.2	166.9	189.6
Eggs	116.8	121.6	130.5	136.2
Cereal and bakery products	121.2	127.9	140.5	150.7
Dairy products	120.3	126.5	138.6	149.1
Milk and cream	115.0	119.6	127.9	134.3
Cheese	127.0	135.5	152.5	167.7
Other dairy products	124.0	131.8	146.6	161.0
Fruits	125.3	134.0	154.3	176.9
Fresh	125.7	134.9	157.1	183.6
Processed	125.1	133.1	149.8	165.3
Vegetables	126.8	135.4	153.4	169.0
Fresh	127.5	136.4	155.2	172.2
Processed	125.2	133.1	148.9	161.6
Sugar and sweeteners	121.4	127.8	139.4	149.4
Nonalcoholic beverages	113.7	127.3	139.7	149.5
Fats and oils	120.8	130.8	145.6	158.1
Butter	123.5	137.4	156.5	176.3
Margarine	128.3	126.7	137.3	143.4
Other	121.6	128.7	142.3	153.7
Miscellaneous foods	124.0	131.4	146.7	160.9
Alcoholic beverages	134.8	147.7	178.3	215.3

Putting All the Changes Together

In reality, changes in income growth and the age and size of the population do not occur in isolation. Thus, their effects must be combined to evaluate the total impact on national food demand over the next several decades.

Projections indicate that national food expenditures will increase 81.8 percent between 1980 and 2020 *(table 3)*. While away-from-home food expenditures may rise 112.2 percent, at-home food spending could increase 61.7 percent. Major food groups expected to show the largest expenditure increases between 1980 and 2020 are meat, poultry, fish, and eggs, 64.1 percent; fruits, 76.9 percent; and vegetables, 69.0 percent. Population and income changes will have the smallest combined effect on cereal and bakery products, dairy products, sugar and sweeteners, and nonalcoholic beverages.

Commodities rising the most include fish, 89.8 percent; fresh fruits, 83.6 percent; fresh vegetables, 72.2 percent; butter, 76.3 percent; and alcoholic beverages, 115.3 percent. Smaller increases are expected for eggs, up 36.2 percent; milk and cream, 34.3 percent; and margarine, up 43.4 percent. □

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Building a Foodservice Database

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An estimated 42 cents of every food dollar spent in 1984 went to the foodservice industry—those that take care of all our away-from-home eating needs. That's up from 27 cents in 1960. After adjusting for inflation, away-from-home food expenditures increased 2.7 percent annually from 1954 to 1984, compared with increases averaging 1.3 percent a year for food at home. During the same period, per capita disposable personal income gained 2.2 percent annually, contributing to the steady foodservice gains.

Substantial changes in the structure and organization of the foodservice industry have paralleled its rapid growth. Fast food outlets, franchise firms, and large chains have proliferated, while restaurant diners—establishments which usually provide waiter or waitress service at counters and booths—have declined from 23 percent of all eating places 15 years ago to less than 10 percent today. As a result, the nature of the foodservice delivery system and the mix of foods consumed away from home have changed considerably.

As the food-away-from-home industry grew, so did the need for a reliable set of standards for measuring changes and capturing appropriate and useful data. The Economic Research Service, after working with industry representatives for almost two decades, has developed definitions, data sources, methodologies, procedures for collecting information, and techniques for estimating food costs, sales, and outlets.

The result of this cooperative effort is the publication, *Definition of the Foodservice Industry and Methodology for Estimating Selected Statistics.* The report provides industry analysts and researchers with information to identify trends, measure change, and assess the implications of change in industry structure, away-from-home sales, and food use by producers, manufacturers, and participants in the foodservice delivery system.

As the food-away-from-home industry grew, so did the need for a reliable set of standards for measuring change and capturing useful data.

The authors are agricultural economists with the Food Marketing and Consumption Economics Branch of the National Economics Division.

Gains and Losses

The foodservice industry consists of individual market segments, each with specialized requirements for food, equipment, and supplies. Each segment uses unique methods of purchasing, storing, preparing, and serving meals and snacks according to the needs of its customers. Thus, expansion or shifts within segments can have implications for the many industries serving the foodservice sector.

To track the changes in particular industry segments, the ERS database provides detailed information on the commercial and noncommercial sectors of the foodservice industry. Commercial foodservice establishments exist primarily for profit and include everything from hotel restaurants and drugstore luncheon counters to separate eating places. Noncommercial foodservice operations, such as nursing homes, child day-care centers, factories, and the military, in contrast, provide a feeding service and are not necessarily profit makers.

The total number of places providing food service increased 13 percent between 1977 and 1984 to 706,098 *(table 1).* Foodservice sales rose 94 percent between those years to $158.5 billion. Real sales (adjusted for inflation) were up over 18 percent from 1977 to 1984.

In the commercial foodservice sector, the number of establishments increased only 2 percent between 1977 and 1984, but real sales were up 23 percent. Fast food outlets, by far the fastest growing group in the commercial sector, added 23 percent more units and increased real sales by almost 40 percent in the reporting period. In contrast, the number of cafeterias and the number of separate drinking places each declined by about 19 percent from 1977 to 1984; real sales were unchanged in cafeterias and down 34 percent in separate drinking places.

In the noncommercial foodservice sector, the number of establishments increased 33 percent between 1977 and

Table 1. Foodservice Outlets and Sales Increased Since 1977

Industry segment	Number of establishments			Sales of meals and snacks (in $ millions)			
	1977	1984	Percent change	1977	1984	Percent change	Percent change in real sales[1]
Commercial feeding	401,502	409,453	2.0	56,624	116,095	105.0	23.2
Separate eating places	229,892	253,854	10.4	47,426	99,582	110.0	26.1
Restaurants, lunchrooms	118,896	124,433	4.7	24,720	48,419	95.9	17.7
Fast food outlets	100,493	123,769	23.2	20,334	47,319	132.7	39.8
Cafeterias	7,001	5,640	−19.4	1,813	3,022	66.7	0.1
Lodging places	25,931	23,262	−10.3	3,613	7,264	101.1	20.8
Retail hosts[2]	60,652	56,348	−7.1	2,691	4,779	77.6	6.7
Recreation, entertainment[3]	33,619	34,282	2.0	1,915	3,394	77.3	6.5
Separate drinking places[4]	51,408	41,706	−18.9	979	1,076	9.9	−34.0
Noncommercial feeding	223,005	296,645	33.0	25,152	42,390	68.5	8.0
Education	97,325	95,888	−1.5	8,242	12,239	48.5	−1.9
Elementary and secondary	91,300	89,600	−1.9	5,886	7,930	34.7	−6.4
Colleges and universities	3,095	3,288	6.2	2,256	4,092	81.4	9.0
Other	2,930	3,000	2.4	100	217	116.7	30.2
Plants, office buildings	15,187	15,846	4.3	3,576	6,793	89.9	14.1
Hospitals	7,099	6,861	−3.4	3,711	5,817	56.8	−5.8
Care facilities	21,117	28,933	37.0	2,388	5,281	121.2	53.6
Vending machines	3,737	3,556	−4.8	2,508	3,553	41.7	−14.9
Military services	3,971	3,352	−15.6	1,595	2,366	48.3	−0.5
Troop feeding	1,435	1,310	−8.7	1,245	1,765	41.8	−1.5
Clubs and exchanges	2,536	2,042	−19.5	350	601	71.7	3.2
Transportation	799	642	−19.6	1,079	1,922	78.1	7.1
Associations[5]	18,966	19,394	2.3	958	1,562	63.0	−2.1
Correctional facilities	6,907	7,164	3.7	492	1,155	134.8	63.0
Child day care	18,967	84,175	343.8	249	760	205.2	111.8
Elderly feeding programs	11,173	14,035	25.6	202	689	241.1	136.5
Other	17,757	16,799	−5.4	151	252	66.9	0.5
Total	624,507	706,098	13.1	81,776	158,485	93.8	18.4

[1]Consumer Price Index (1967=100). [2]Food services operating within retail establishments such as department stores, variety stores, bakeries, and drugstores. [3]Theaters, amusement parks, stadiums, and racetracks. [4]Data base counts only food and nonalcoholic beverage sales. [5]Membership organizations engaged in civic, social, or fraternal activities (including their lodges or hotels).

1984, but real sales were up only 8 percent. Child day care, elderly feeding programs, and nursing and other care facilities led the noncommercial sector gains. The number of foodservice establishments in correctional facilities was up only 3.7 percent from 1977 to 1984, but real sales climbed 63 percent during the reporting period as the prison population increased by nearly 50 percent. In contrast, food service from vending machines and in schools, hospitals, and the military services declined in both number of establishments and real sales.

The New Industry Standard

The ERS foodservice data are quickly becoming the standard for the industry. The series will appear in the annual *Statistical Abstract of the United States* published by the Department of Commerce and in *Agricultural Statistics*, issued each year by the Department of Agriculture. The International Foodservice Manufacturers Association has also accepted the ERS methodology and definitions as its industry standard.

ERS will update the data base annually and issue a full report on the industry in 1986. This combination of information will provide those producing and marketing food with important current intelligence to aid in making decisions. □

Reference

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Production and Marketing Changes for Red Meat and Poultry

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We're a nation of meat and poultry eaters, more so than ever...211 pounds for each of us in 1984, up from 164 pounds in 1955. Estimates indicate that per capita meat and poultry consumption was 214 pounds in 1985.

The mix has changed, too. Despite a rise from 71.8 to 80.4 pounds per capita between 1955 and 1984, beef and veal's share of total meat consumption dropped from 44 to 38 percent. Chicken and turkey were the big gainers, jumping from 26.3 pounds in 1955 to 67.1 pounds per capita in 1984. Their share of total meat consumption increased from 16 to 32 percent. Pork consumption at 62 pounds in 1984 was virtually the same as in 1955, although its share declined from 38 to 29 percent.

Underlying much of these changes is an industry that has modernized its production processes, taking advantage of technology to reduce costs and increase production to record levels. But greater efficiencies, modern technologies, and creative management practices have not prevented the meat industry from facing some bad times in the past three decades. This is an industry made up of both large and small producers who have virtually no control over the price of their main input, feed, or their product prices. As a result, reduced corn supplies or overexpansion by producers can mean the difference between profits and losses.

Production Shifts Among Meats

Before 1953, pork had the largest share of U.S. meat sales. More than 2 million farmers produced hogs in small enterprises, all using similar management practices. Per capita consumption remained relatively stable, with swings largely accounted for by production cycles.

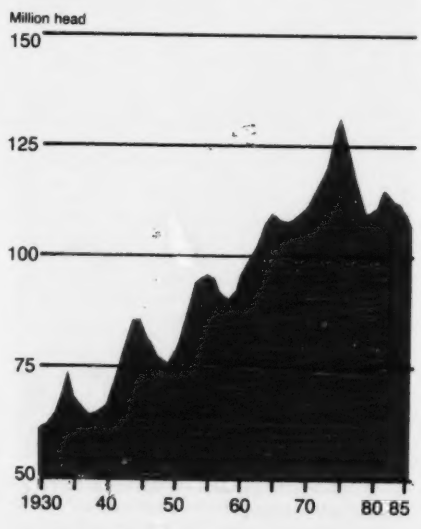
Beef production expanded during the early 1950's and, in 1954, per capita consumption rose above that of pork for the first time. The hog sector faced several adjustments. Vegetable oils began to give much stiffer competition to the lard market, and the price of lard fell. With lower demand for lard, hog producers became mainly meat producers. Meanwhile, consumer preference for leaner meats further encouraged a shift toward a leaner hog.

Change was also afoot in the poultry industry. Before the early 1950's, broilers were raised in small flocks near cities as a secondary activity to egg production. Advances in feeding and housing methods, breeding and disease control, and management all spurred poultry into the modern age.

The Early 1970's: A Time for Beef Expansion

Low grain prices, growth in consumer incomes, and low inflation rates in the late 1960's and early 1970's provided the economic incentives to continue expanding beef production. The cattle inventory grew at an unprecedented rate, peaking at 132 million head in 1975 *(figure 1)*. In addition, and perhaps more important, cattle were coming to market heavier as more were marketed from feedlots.

Figure 1. U.S. Cattle and Calf Inventory Peaked in 1975



In the 1950's, most cattle were grass-fed, with only a few readied for market on grain in farmer-owned feedlots in the North Central States. By the late 1950's, large commercial feedlots began to appear in the West and Great Plains.

This trend continued into the 1960's. Aided by irrigation, grain sorghum production increased, creating a grain surplus and a new feed base for beef production. Feedlots were organized into large commercial operations able to attract outside capital.

Grain feeding had the added benefit of reducing the time from weaning to slaughter. Until the early 1960's, grass-fed steers were typically slaughtered at 3 to 4 years of age. Grain feeding cut the time to about 18 months for the same average weight. Consumer preferences shifted to the higher quality, grain-fed beef, encouraging greater production.

Cattle feeding also became more efficient because of additives, nutrition research, and genetic improvement in herds. By 1973, the average live weight of cattle slaughtered reached 1,043 pounds, a substantial increase from about 1,000 pounds in 1960. In 1968, when the inventory was about the same as on January 1, 1985, commercial beef production was 20.7 billion pounds, with an average dressed weight of 590 pounds. In 1984, production was 23.4 billion pounds, and the average dressed weight was 623 pounds.

With the incentives and capacity to increase output in the first half of the 1970's, cattle producers overexpanded their herds. In addition, grain prices rose in 1974, and feedlot operators adjusted to higher costs of production by lowering their bids for the cattle they bought to put on feed. Forage supplies also became a problem as land reverted to crop production and carrying capacity on permanent pastures declined because of reduced fertilizer use in the Southeast. Until the mid-1970's, producers in every sector of

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Severe cash flow problems caused by low prices and declining land values have hindered cow-calf producers throughout the 1980's.

the cattle industry had profited from generally expanding beef supplies and consumption.

From 1975 to 1979, the cattle industry went through the sharpest liquidation ever experienced. In 4 years, the inventory fell 22 million head to 110 million. With the sharply reduced inventory and rapidly rising consumer incomes, producers received record-high cattle prices during 1979/80. Net returns (receipts minus cash expenses) substantially improved and remained positive from 1978 to 1980 *(figure 2)*. As a result, herd buildup began again, but this increase halted in 1982. Prices had dropped because of expanding pork and poultry production and reduced consumer buying power that came with the recession.

Severe cash flow problems caused by low prices and declining land values have hindered cow-calf operators. The current cattle cycle began with an inventory of 110 million head in 1979. It increased to only 115.4 million head in 1982 before being choked by financial problems and drought-reduced forage supplies.

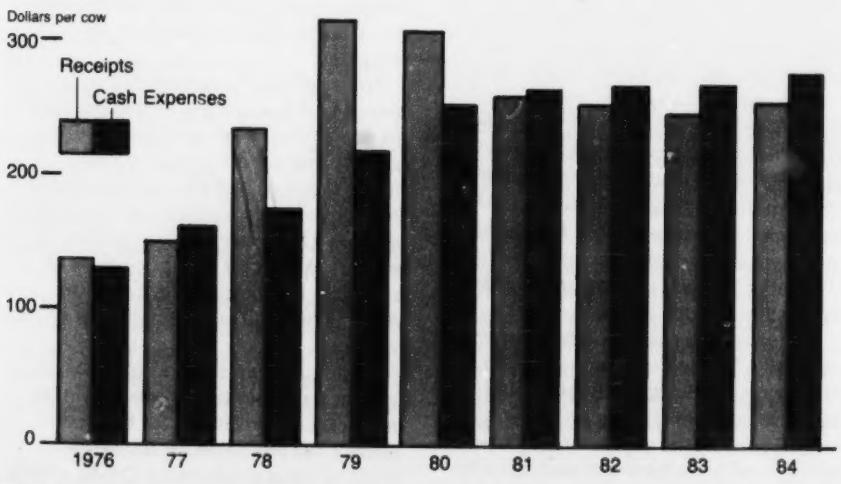
Since 1980, net returns have fallen about $80 per cow for cow-calf production in the United States. In the Great Plains region net returns fell from an average $65 per cow in 1980 to $1 in 1984. As rising fertilizer costs have pushed up forage costs, net returns in the Southeast have been less than expenses since 1981. The large decrease in net returns from 1980 to 1983 in the Great Plains combined with the drought in 1983 and 1984, reduced the beef cow inventory by 7 percent in 1984.

On January 1, 1986, the inventory was 105.5 million, down 4 percent from a year earlier and the smallest inventory since 1968. Beef cows numbered 33.6 million, down 5 percent from the previous year. In addition, the 1985 calf crop, at 41.0 million head, was the smallest since 1961.

The cattle inventory will probably continue to decline through 1986. Expansion may not resume before 1988 and, then, only at a much slower pace than in previous cycles. Not only has a large portion of the breeding herd gone to market over the past 4 years, but fewer heifers have been retained to replace the cows. Consequently, calf crops have declined each year.

With declining beef supplies and competitive retail prices, cattle prices should strengthen, while low inflation rates will help stabilize production costs. The best inventory level for maintaining a stable cattle industry is difficult to judge, but present forage acreage would probably support 116 to 120 million head.

Figure 2. Receipts Were Above Expenses in Late 1970's, Below Expenses in 1980's



Pork's Market Share Declines

Pork consumption in the United States has been stable for many years, but its market share has declined as total red meat and poultry production has increased. In the 1950's and 1960's, the number of hog producers declined sharply. Farms were combined into larger

units or the hog enterprise was dropped. During this time, farmers were able to move in and out of hog production because the investment required was relatively low.

The sharply higher grain prices that pressured the beef and poultry industries in 1974 also reduced returns to hog producers. Low returns led to herd liquidation and sharply reduced pork production in 1975. In the following years, hog prices rose substantially, corn prices dropped, and hog enterprises became profitable once again.

Pork producers began increasing output but, in contrast to past expansions, many built or remodeled facilities to allow them to raise more hogs or become more specialized, so as to take advantage of economies of size and investment tax incentives. More than a third of farrowing facilities available in 1980 were built during 1975-80. Many producers went heavily into debt for this capital investment. In addition, many also bought more land and crop equipment, increasing their debts.

Although returns were relatively good during 1976-78, the expansion in pork output was not as rapid as in previous years because of the lag associated with planning, financing, and building these facilities. In the past, expansion was just a matter of the biological lag.

The expanded production capacity was in place by 1979, but net returns then plunged because of lower hog and higher corn prices. Furthermore, during the late 1970's and early 1980's, interest rates rose sharply. Many producers had outstanding loans with automatic interest rate adjustments. As interest costs climbed, many had to borrow to cover existing loans. So, caught in a financial squeeze, producers began liquidating the large inventory of hogs and set a commercial slaughter record in 1980 of 96.1 million head. As a result, hog prices during the first half of that year dropped below $30 per cwt from $37. Also that year, corn prices rose from $2.36 a bushel in April to $3.19 in December. With the liquidation of hogs early in the year and increasing feed costs, prices then jumped to $48 by October. Despite the recovery in hog prices, net returns to producers fell sharply.

As production sagged in 1981 and 1982, hog prices rose. In the summer of 1982, they averaged $62 per cwt and, in the fall, a record crop sent corn prices below $2 a bushel. Hog operations started expanding, and pork production increased in 1983.

In early 1983, the Government instituted the Payment-in-Kind program which drastically reduced the acreage planted that year. The program helped push corn prices to an average of about $3 a bushel in the second quarter. The expansion that began the year before pushed 1983 hog prices down from $55 per cwt in the first quarter to $47 in the spring and summer.

As the drought hit during the summer of 1983, corn prices climbed further, and producers reduced herds. Hog prices dropped to $42 per cwt in the fall 1983. That year, producers' returns just covered cash costs. In 1984, returns were only a little better because prices averaged slightly higher and corn prices declined with a larger fall harvest.

The current herd reduction is the result of low returns and financial stress in agriculture. Although feed costs have declined sharply since 1983, hog prices have been pressured by large domestic meat supplies and imported pork and live hogs.

Producers are reducing their herds by selling more young female pigs than normal, rather than retaining them for breeding. These marketings raise cash for operating expenses and paying interest on debt. Based on the market hog inventory and farrowing intentions of December 1, 1985, pork output in 1986 will be down about 2 percent.

Hog prices are likely to average in the mid-$40's for the first quarter of 1986. Some expansion may occur and could continue into 1987 if corn prices remain low. However, the expansionary phase will be modest by historical standards because of the financial problems of many producers, especially in the Corn Belt where the majority of hogs are raised.

Broiler Industry Continues To Grow

The shift to a modern, highly coordinated broiler industry began in the 1960's. After very rapid growth in the 1970's, broiler production has expanded less in the 1980's *(figure 3)*. The largest annual increase in output during this decade occurred in 1981—a 6-percent expansion.

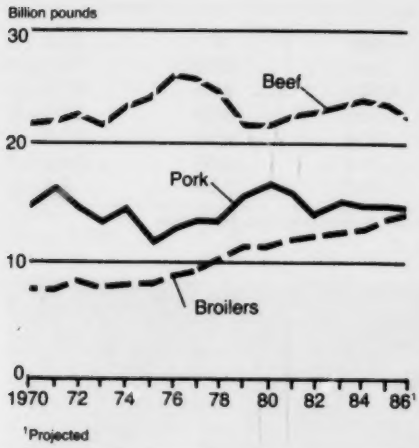
After losses of 5 cents a pound in 1981, broiler integrators (firms that own the birds and contract with farmers to raise them) cut the rate of expansion. Output of broiler meat increased only 1.5 percent in 1982, but profits still evaded producers. They were in the red by 2 to 3 cents a pound. Producers started expanding operations in the first-half of 1983, but the expansion stopped when sharply higher feed costs wiped out profits. For 1983, output was up 2 percent, and producers were in the hole 1.7 cents for every pound sold.

In 1984, for the first time in the 1980's, broiler producers made profits, after having made several cost-saving adjustments. For example, during the 1970's, broiler production could be easily expanded up to 4 percent with extra hatching eggs. Now, hatchery flocks are kept near full capacity with no extra hens, which reduces costs. If extra eggs are needed, however, producers must delay hen slaughter.

Broiler producers are shifting to branded birds and are selling an increasing proportion of their output as cut-up parts. These products usually have higher markups and are more profitable for producers. In addition, some producers have added case-ready products, so retailers can simply take price-marked tray packs of chicken parts out of the shipping box and put them directly in the retail case.

Broiler integrators are also expanding into further processed products. These products are convenient for busy consumers and profitable for the firms. Many of these products are frozen, which

Figure 3. Increases in Broiler Production in 1980's Slow Slightly from Late 1970's



helps in scheduling production because sales are made from inventory. Also, nugget-type processed products have been added to most fast food menus and are selling well.

Broiler integrators' attempts at operating fast food and other restaurants, however, have not been as successful. Presently, the most active firm has sold its restaurants, and one other firm has stopped adding them.

The early 1980's did not provide the returns that broiler producers needed to take advantage of the changing technology. While some firms could add new products and processes, other firms needed a period of profits to finance these technological changes.

The integrators, while now in much better shape financially than they were earlier, are not in a position to finance new production houses. In the past, farmers built and financed the broiler houses, then contracted with integrators. These houses have evolved over time into very specialized structures, highly insulated and expensive to construct.

Adjustment Likely Through End of Decade

Financial stress among livestock producers could persist through the end of the decade, with cash flow shortages for those who are highly leveraged. In addition, meat supplies will likely remain large as poultry and pork producers respond to lower grain prices by expanding output.

Agriculture has become highly capitalized over the last 10 years, and debt financing has become more important. Equipment and machinery investment has become larger, while net returns have declined. The large debt loads carried by many types of farms have reduced producers' alternatives. That is, herd liquidation to raise cash may be the only option for highly leveraged operators. Until the adjustment process is over and costs of production are aligned with prices, livestock cycles will probably be unpredictable.

Prospects are also somewhat clouded by the need for future investment in plants and equipment. By the end of the decade, many facilities will have to be rebuilt. Whether producers will be willing or even able to bear new debt is uncertain. To a large extent, this probably depends on the financial situation of livestock operators (primarily hog and poultry producers) when facilities need to be replaced.

The financial problems that have resulted in adjustments in the cattle and hog sector have not had the same impact on broiler integrators. The broiler integrators have moved into further processed items, and the expanding economy has strengthened their markets and increased profitability. This could give them an edge in expanding production during the next few years as red meat output declines, partially because of the financial problems facing farmers. If the broiler industry does expand, beef and pork will find stiff competition in their recovery.

Meat supplies are expected to remain near record levels through the end of the decade, and meat prices may rise less than the general rate of inflation. Beef may continue to lose some of its share of the market because of herd reduction, while poultry will gain because of its lower relative price. Pork's market share will fluctuate cyclically, but hog cycles are expected to be less volatile than in the past.

The cattle, hog, and poultry industries are dynamic and constantly adjusting to socio-economic change. However, the 1980's have added a deflationary environment that has resulted in the largest drop in land values since the 1930's. In addition, livestock and grain prices have dropped sharply as supplies have reached record levels. The adjustment process has been, and will likely continue to be, very difficult for many producers.

Currently, farmers that might want to grow broilers would probably have a harder time arranging financing because lenders may be reluctant to add new agricultural loans to their portfolios. Thus, broiler expansion may be limited by a lack of building capital. Some expansion will be possible by using older houses and cutting the time between batches of broilers. Given the low returns of the early 1980's, broiler integrators will likely continue expanding operations only in line with growth in their food-processing sales. □

U.S. Consumers Spend World's Smallest Share on Food

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Americans, on average, allocate a smaller share of their total expenditures for food than people in other countries of the world. This reflects both the relatively high incomes and low food prices of the United States. An average of 14 percent of U.S. consumers' total private expenditures (excludes savings and taxes) went for at-home food and beverages in 1982, the latest year for which comparable developed country data are available *(table 1)*. The U.S. share for food alone averaged 12 percent.

In contrast, over 18 percent of Canadian consumer expenditures were for food and beverages, with food accounting for almost 15 percent. The shares for British consumers were 17.8 percent for food and beverages and about 15 percent for food. Italy topped the list of seven developed countries, with consumers spending 28.8 percent of total private expenditures for food and beverages and 26.7 percent for food.

The percentage of expenditures for food declined in most developed countries between 1972 and 1982, reflecting abundant supplies and rising incomes.

As expected, the proportion of expenditures devoted to food is much higher in the less developed countries, according to 1980 data (the latest available for worldwide comparisons). In China, consumers allocated an average of 60 percent of their total spending for food, with beverages accounting for another 2 percent *(table 2)*. Only consumers in Niger spent a larger share—almost 62 percent—of total expenditures for food and about 2 percent for beverages.

Consumers in the Soviet Union devoted almost 37 percent of total expenditures to food and beverages. Food accounted for about 26 percent and alcoholic beverages nearly 10 percent of total expenditures. □

Table 1. U.S. Had Smallest Share of Expenditures for Food in 1982

Country	Total private expenditures	Food expenditures	Food	Food and beverages
	U.S. dollars per person		Percent	
Italy	3,731	996	26.7	28.8
West Germany	6,054	1,401	23.2	NA
France	6,248	1,101	17.6	20.1
Australia	6,573	1,108	16.9	22.3
United Kingdom	4,661	708	15.2	17.8
Canada	6,858	1,010	14.7	18.2
United States	8,644	1,050	12.1	14.4

Source: OECD *National Accounts 1970-82*, Volume II, 1984 edition. Percentages computed by ERS.

In China, an average of 60% of total consumer expenditures went for food.

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Table 2. Niger and China Rank Highest in Share of 1980 Expenditures for Food

Country	Food	Nonalcoholic beverages	Alcoholic beverages	Tobacco	Food, beverages, and tobacco
			Percent		
Niger[1]	61.6	0.8	1.0	2.3	65.7
China	60.0	1.0	1.0	2.0	64.0
India	55.6	.9	1.5	2.2	60.2
Sri Lanka	55.4	.3	3.4	5.6	64.7
Philippines	54.9	1.1	3.0	3.0	62.0
Jordan	54.6	1.3	.4	2.3	58.6
Ghana	53.6	.8	3.0	1.2	58.6
South Korea	47.3	.5	2.6	1.6	52.0
Honduras	44.1	[1.2	5.8	2.5][4]	53.6
Thailand	41.8	2.2	5.0	2.7	51.7
Portugal	38.4	1.5	8.1	2.1	50.1
Panama	38.2	1.2	3.3	1.6	44.3
Greece	38.0	.9	2.3	2.5	43.7
Yugoslavia[2]	37.8	1.8	6.0	2.8	48.4
El Salvador	36.8	1.1	2.6	1.3	41.8
Jamaica	36.6	1.0	4.2	5.4	47.2
Sudan	35.8	.1	.9	1.5	38.3
Zambia	[33.5	.9	3.4	2.6][4]	40.4
Mexico	[32.2	1.1	2.3	1.7][4]	37.3
Venezuela	[32.8	.8	4.7	3.2][4]	41.5
Spain	29.6	.4	1.2	1.0	32.2
Poland [2]	28.3	2.3	12.1	2.6	45.3
Hungary[2]	27.6	1.2	11.6	2.4	42.8
Italy	27.2	.3	2.0	1.9	31.4
Israel	25.6	1.0	.8	1.4	28.8
USSR	25.6	[1.0	10.0	4.0][4]	40.6
South Africa	25.2	1.3	4.7	2.5	33.7
Zimbabwe[3]	24.6	2.2	[6.2	4.0][4]	37.0
Puerto Rico	23.5	.7	3.8	1.8	29.8
Singapore	23.4	1.4	2.5	2.6	29.9
Ireland	22.9	1.3	10.3	3.5	38.0
Hong Kong	21.9	1.1	1.6	1.4	26.0
Japan	[21.6	.6	1.4	1.3][4]	24.9
Finland	21.0	.5	4.0	2.1	27.6
Norway	20.1	1.0	3.5	2.1	26.7
Switzerland	20.1	.8	4.3	2.2	27.4
Austria	19.9	.7	2.5	2.4	25.5
West Germany	[19.5	.8	3.5][4]	2.0	25.8
Belgium	18.2	1.0	3.3	1.6	24.1
France	18.0	.5	2.1	1.0	21.6
Sweden	17.8	.6	3.9	2.2	24.5
Denmark	17.7	[.8	4.5	2.8][4]	25.8
Australia	17.3	.3	5.7	2.0	25.3
United Kingdom	16.5	.7	2.0	3.1	22.3
Canada	15.2	.9	2.4	2.1	20.6
Netherlands	14.8	.5	2.0	2.0	19.3
United States	12.7	.8	1.7	1.2	16.4

[1]For 1979. [2]Expenditures for alcoholic beverages were estimated from those reported for all beverages. [3]For 1977. [4]Distribution within group was estimated.

Source: United Nations *National Account Statistics, 1980.*

What Percentage Do Americans Spend on Food?

There can be more than one answer. This article, for example, presents a different figure than the following article, "Food Spending and Income," for two reasons. First, this article measures food spending against total personal consumption expenditures, while the following article considers food spending as a percentage of total personal disposable income. Disposable income is a larger figure because expenditures exclude savings. ERS does not currently have data to estimate the share of personal disposable income spent for food for many countries.

In addition, the data in this article are only for at-home food and beverages, whereas the following article reports at-home, away-from-home, and total food expenditures as a percentage of income.

Food Spending and Income

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Personal consumption expenditures were about $2.6 trillion in 1985, an increase of 6.6 percent from a year earlier. Of this total, $420 billion was for food, up 5.5 percent from 1984 and 13.7 percent above food expenditures in 1983 *(table 1)*.

Food-at-home expenditures reached $291 billion, up 4.9 percent from a year earlier, while away-from-home food spending was up 6.7 percent to $130 billion. After adjusting for food price inflation, which has been low in the food-at-home market, expenditures on food at home were up 3.7 percent from last year. In the away-from-home food market, expenditures rose only 2.6 percent after adjusting for inflation. Prices in the restaurant industry have risen at a higher rate than the food-at-home market because restaurant meal prices are much more heavily weighted by food service costs than raw product costs. Thus, food-away-from-home costs are highly affected by inflation in the general economy.

Food expenditures increased from 14.9 percent of personal disposable income in 1984 to 15.0 percent in 1985. The proportion of income spent on food varies widely among different income groups and generally declines as income rises. Data from the Bureau of Labor Statistic's 1982/83 Consumer Expenditure Interview Survey (the latest data available) reveal that households earning less than $10,000 spent an average of 36.5 percent of their pre-tax income on food. The percentages for other income groups were: $10,000-$14,999, 19.9 percent of income; $15,000-$19,999, 16.1 percent; $20,000-$29,999, 13.8 percent; $30,000-$39,999, 11.5 percent; and $40,000 and up, only 8.8 percent. The average for all households surveyed was 13.6 percent of pre-tax income. These figures include only households designated as having complete income reporting, but do not account for possible under-reporting of income. □

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Table 1. How Disposable Personal Income Is Spent[1]

	1983	1984	1985
		Billion dollars	
Disposable personal income	2,425.4	2,670.2	2,801.1
Total personal consumption expenditures	2,229.3	2,423.0	2,581.9
Nondurables	817.0	872.4	912.5
Food, excl. alcoholic beverages	369.8	398.6	420.3
At home	258.0	277.0	290.6
Away from home	111.7	121.6	129.7
Alcoholic beverages	52.3	53.1	53.9
At home	33.4	33.1	33.2
Away from home	18.9	20.0	20.7
Cleaning and household supplies	23.6	25.1	26.5
Toiletries	20.4	22.0	23.3
Tobacco	28.0	30.3	32.1
Drugs	24.4	26.4	28.3
Clothing and shoes	135.2	147.4	156.1
Gas and oil	90.1	90.7	92.0
Fuel oil and coal	17.5	17.9	15.8
Other	55.6	60.9	64.1
Durables	289.6	331.1	360.8
Motor vehicles and parts	130.6	153.8	167.7
Furniture and household equipment	107.4	119.4	128.9
Other	51.7	57.9	64.1
Services	1,122.7	1,219.6	1,308.7
Housing	344.0	371.3	403.3
Household operation	155.9	166.0	173.2
Transportation	74.7	82.1	86.8
Personal care	28.1	29.5	31.0
Medical care	237.4	259.5	280.3
Personal bus. service	132.6	147.4	160.3
Recreational services	61.0	65.4	69.0
Other	89.0	98.5	104.8
Savings	133.2	172.5	129.7
Other[2]	62.9	74.7	89.5

[1]Reflects data as of January 22, 1986. [2]Includes interest paid by consumers to businesses and personal transfer payments to foreigners.

Source: U.S. Department of Commerce, Bureau of Economic Analysis.

Recent Trends in Domestic Food Programs

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This article compares food program participation and costs for the July-September quarter of 1985 with the same 3 months of 1984. Preliminary data are reported as of November 1985 and are subject to revision. Entitlement and bonus commodities are included where applicable. Administrative costs are excluded unless noted.

An average of 7.2 million households participated in the Food Stamp Program (FSP) during the third quarter of 1985, a decline of 1.7 percent from 1984. The average number of people participating in the program fell by 2.4 percent, from 20.0 million to 19.5 million, largely reflecting the improvement in the national economy *(table 1)*. Average monthly benefits rose 4.4 percent to $44.21 per person. Federal expenditures (including administrative costs) totaled $2.83 billion during July-September 1985, up from $2.76 billion. Food stamp benefits represented 91.4 percent of total program expenditures, compared with 91.8 percent in the third quarter of 1984.

Average participation in the Nutrition Assistance Program (NAP) in Puerto Rico totaled 1.5 million persons in 1985, the same as a year earlier. The program is operated and funded separately from the FSP and has been funded at a constant level of $825 million since its inception in July 1982. The NAP provides cash benefits to aid participants in purchasing a nutritionally adequate diet. Average monthly benefits per person rose 6.3 percent to $47.11 during the third quarter of 1985. The total value of benefits distributed to participants reached $208.4 million, a 4.5-percent increase.

Child Nutrition Programs

An average of 23.2 million children participated each day in the National School Lunch Program (NSLP) during September 1985, compared with 23.4 million a year earlier. Data for July and August are excluded because most schools are not in session during the summer months. During the school year, the program is available to about 90 percent of the children enrolled in public and private elementary and secondary schools. Private schools may offer the program if their annual tuition is less than $1,500 per child.

Federal expenditures for the NSLP rose 4.0 percent to $482.8 million, including commodities and cash-in-lieu of commodities.

Cash expenditures for the School Breakfast Program declined 0.2 percent from $50.09 million to $49.98 million *(table 2)*, while average daily participation remained at 3.2 million children. Of the 74.4 million breakfasts served in the third quarter of 1985, 84.8 percent were free, 4.0 percent were purchased at a reduced price, and 11.2 percent were purchased at the full price.

A total of 145.4 million meals were served under the Child Care Food Program, an 8.2-percent increase over the previous year. Food costs for the Child Care Food Program totaled $97.6 million, an 11.8-percent increase from the third quarter of 1984.

The Summer Food Service Program funds snacks as well as meals for children in needy neighborhoods when school is not in session. In July 1985, daily attendance at facilities offering the program was 1.5 million. A total of 62.9 million meals were served during the third quarter of 1985, compared with 58.7 million meals a year earlier. Meal costs and the value of commodities distributed to participants rose from $75.3 million to $83.1 million, a 10.4-percent increase.

Preliminary data show that the Special Milk Program served 39.0 million half pints of milk in the third quarters of both 1984 and 1985. Federal expenditures for this program amounted to $3.75 million, up slightly from $3.66 million a year earlier.

Table 1. Average Participation in USDA Food Programs

Program	July-Sept. 1984	July-Sept. 1985
	Millions	
Food Stamp Program	20.0	19.5
National School Lunch Program[1]	23.4	23.2
School Breakfast Program[1]	3.2	3.2
Special Supplemental Food Program for Women, Infants, and Children (WIC)	3.1	3.2
Nutrition Assistance Program in Puerto Rico	1.5	1.5
Child Care Food Program[2]	1.0	1.0
Summer Food Service Program[3]	1.4	1.5
	Thousands	
Commodity Supplemental Food Program	140.5	140.7
Elderly Feeding Pilot Project	17.7	19.3
Food Distribution Program		
Indian Reservations	126.4	139.2
Trust Territories	2.4	4.8

[1]September only. [2]Average daily attendance in September. [3]Average daily attendance in July.

Source: Monthly data from the Food and Nutrition Service.

Supplemental Food Programs

The Special Supplemental Food Program for Women, Infants, and Children (WIC) served an average of 3.2 million participants per month, compared with 3.1 million a year earlier. In the third quarter of 1985, children accounted for 1.6 million participants; infants, 891,000; and women, 687,000. Food costs totaled $309.1 million, up from $281.2 million in the previous year.

The Commodity Supplemental Food Program (CSFP), which is similar to the WIC program, currently operates in 12 States and the District of Columbia. Average participation was 140,700 per

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month in July-September 1985, compared with 140,500 a year earlier. Food costs for the program were down about $850,000 to $8.9 million.

The Elderly Feeding Pilot Project served about 19,300 persons during the third quarter of 1985, a 9-percent increase from a year earlier. Total costs, however, declined approximately $60,000 to $587,000 during the same period due to lower food costs and administrative expenses. Food costs declined by 5.6 percent from $537,000 to $507,000, while administrative expenses fell by 27.5 percent from $110,000 to $80,000.

Food Distribution Programs

The Food Distribution Program helps needy families living on Indian reservations and in the Trust Territories of the Pacific Islands by providing food packages containing USDA-donated foods. The Food Distribution Program had three more projects participating in September 1985, for a total of 104. Food costs amounted to $12.2 million, a 5.8-percent increase over the third quarter of 1984.

The Nutrition Program for the Elderly served an average of 907,000 meals daily at approximately 14,000 sites. In com-

Table 2. Federal Cost of USDA Food Programs[1]

Program	1983	1984	1984 (quarters)[2]				1985[2]		
			I	II	III	IV	I	II	III
			Million dollars						
Family Food									
Food Stamps	11,119	10,675	2,769	2,668	2,534	2,703	2,771	2,694	2,582
Nutr. Asst. Prog. in Puerto Rico[3]	825	825	206	206	206	206	206	206	206
Food Distribution									
Food Distribution on Indian Reservations	36	43	10	10	12	12	12	12	12
Schools[4]	819	828	270	161	148	246	273	150	157
Other[5]	229	225	66	61	44	54	47	59	52
Temporary Emergency Assistance[6]	1,130	1,059	269	269	249	272	256	241	189
Cash in lieu of Commodities[7]	126	133	36	30	36	31	36	35	34
Child Nutrition[8]									
School Lunch	2,443	2,550	827	606	318	800	807	643	328
School Breakfast	357	378	119	91	50	119	117	99	50
Child Care Food and Summer Food Serv. Prog.	401	454	93	108	155	98	101	119	173
Special Milk	17	16	5	4	4	4	4	4	4
WIC[9]	1,194	1,417	349	351	354	363	368	375	385
Total[10]	18,696	18,603	5,023	4,612	4,063	4,908	4,998	4,637	4,172

[1]Calendar years. Administrative costs are excluded unless noted. [2]Preliminary. Quarterly data may not add to annual total due to rounding. [3]Puerto Rico transferred from the Food Stamp Program to a substitute nutrition assistance program on July 1, 1982. Includes special projects expenditures. [4]National School Lunch, Child Care Food, Summer Food Service programs, and commodity schools. [5]Commodity Supplemental Food Program, Elderly Feeding Pilot Project, Nutrition Program for the Elderly, and donations to charitable institutions. [6]Initiated December 1981. [7]Child nutrition programs and the Nutrition Program for the Elderly. [8]Cash expenditures. [9]Special Supplemental Food Program for Women, Infants, and Children. Includes administrative costs. [10]Program data may not add to total because of rounding.

Source: Monthly data from the Food and Nutrition Service.

parison, the program served an average of 865,000 meals at about 13,000 sites in the third quarter of 1984. Meal costs fell about $2.2 million to $31.8 million, with cash-in-lieu of commodities accounting for $28.3 million of the total.

The Temporary Emergency Food Assistance Program distributed $189.5 million in commodities, a 23.8-percent decrease from $248.8 million in the third quarter of 1984. The program distributes surplus commodities to low-income U.S. households. It has the dual goals of reducing Federal surplus inventories and storage costs and providing nutritional assistance to needy persons. A major source of the decline was a reduction in the level of butter distributed—from 12 to 6 million pounds per month. This was largely in response to the provisions of the authorizing law which require a reduction in donations if a substantial amount of margarine sales are displaced by the donations. □

Food Stamp Benefits Rise

Maximum food stamps benefits rose 1.3 to 1.7 percent in October 1985 to reflect the cost of the Thrifty Food Plan (TFP) in June 1985. In the 48 coterminous States and the District of Columbia, maximum benefits for a family of four increased from $264 per month to $268. Benefits for other household sizes are shown on the accompanying table. Benefits are higher in Alaska, Hawaii, Guam, and the Virgin Islands to account for significantly higher food prices.

Food stamp benefits are based on the cost of the TFP and net household income. The TFP is the least costly of four food plans developed by USDA. It specifies the amounts of foods from 31 different food groups that households might use to provide nutritious diets for household members. Each month USDA estimates the cost of the TFP and the other food plans. The cost of the TFP in June of each year for a specifically defined family of four represents the maximum allotment for a four-person household. This allotment is adjusted to reflect larger or smaller household sizes.

Eligible households with no net monthly income receive the maximum food stamp allotment. For households with net monthly income, the maximum allotment (for the household size) is reduced by 30 percent of the household's net monthly income. Non-elderly households are allowed the following deductions from gross income to determine net income: an 18-percent deduction from earned income, a $98 standard deduction, and a deduction up to $139 for shelter/dependent care costs. Households with a disabled or elderly member are exempted from this limit. They are entitled to subtract the full value of all shelter costs greater than 50 percent of their adjusted income. Further, any monthly medical expenses for the elderly or disabled member over $35 can be deducted from the total gross income for the household.

Changes legislated in the Food Security Act of 1985 (popularly known as the 1985 Farm Bill) will alter various elements of the Food Stamp Program, including some of the above. These changes will be detailed in an upcoming *National Food Review* article.

Maximum Food Stamp Benefits[1]

Household Size	Nov. 1984 to Sept. 1985	Oct. 1985 to Sept. 1986
	Dollars	
1	79	80
2	145	147
3	208	211
4	264	268
5	313	318
6	376	382
7	416	422
8	476	483
Each additional member	+59	+60

[1] Benefits schedule for the 48 coterminous States and the District of Columbia. Separate schedules exist for urban and rural Alaska, Hawaii, Guam, and the Virgin Islands.

Sources: U.S. Dept. of Agriculture, Food and Nutrition Service, Food Stamp Program, March 1985, p. 6, and Federal Register, Vol. 50, No. 174, September 9, 1985, p. 36642.

Food and Nutrition Legislation

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Numerous food and nutrition bills have been introduced in Congress. Some of the recent proposals are briefly described below.

Food Safety and Quality

H.R. 3488 - Rep. John Seiberling (OH)

This bill would amend the Agricultural Marketing Act of 1946 to make nutritional content a factor in classifying agricultural products. Under the provisions of the 1946 Act, USDA has developed a grading and classification system for many types of agricultural products—for example, fruits, vegetables, grains, livestock, and poultry—based on class, quality, quantity, and condition. This bill would require that USDA add nutritional content to the other criteria used to determine quality.

H.R. 3637 - Rep. Vic Fazio (CA)

This bill would provide for payment of losses incurred by domestic manufacturers, packers, canners, and distributors as a result of the ban on cyclamates announced on October 18, 1969, by then-Secretary of the Department of Health, Education, and Welfare, Robert Finch. Many companies were left with substantial inventories of prepared and packaged foods containing cyclamates. This bill would stipulate that the Government did not follow correct procedures in implementing the ban and would allow any entity with a case to go directly to court to establish damages. The United States Claims Court would have jurisdiction to hear and render judgement on the amount of any claims. Suits would have to be filed within 1 year after enactment of this bill.

H.R. 3751 - Rep. Charles Rangel (NY)
S. 1699 - Sen. Howard Metzenbaum (OH)

These identical bills, called the Nutritional Information Labeling Act of 1985, would amend the Federal Food, Drug, and Cosmetic Act to require that food labels contain information on fats, cholesterol, sodium, and potassium. The label would have to state the common name of all fats and oils in the food, plus the number of grams and calories for each. Fats would be further categorized as saturated, polyunsaturated, and monounsaturated—listing the grams and calories of each group. The number of grams of cholesterol in the food would also appear on the label. In addition, the bills would require the label to list the number of milligrams of sodium and potassium in the food (manufacturers with sales of less than $500,000 would be exempt from this provision). The Department of Health and Human Services would have 8 months after enactment to draft appropriate regulations to take effect 10 months later.

Other Legislation

S. 1553 - Mark Hatfield (OR)

This bill, entitled the Beverage Container Reuse and Recycling Act, would require a deposit on beverage containers to promote a national system for reusing or recycling these empty containers. The refund value of the container could not be less than 5 cents. In the bill, beverage is defined as beer or other malt beverages, mineral water, soda water, or carbonated soft drinks. These deposit provisions would take effect 2 years after passage of the bill. Presently nine States have similar laws. □

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USDA Actions

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USDA regularly implements operational and regulatory changes that affect the status of food and nutrition in the United States. Here are some recent actions.

Medfly Restrictions: All Federal restrictions relating to the Mediterranean fruit fly quarantine in Dade County, Florida, have been lifted. Fresh fruits, vegetables, and plants can again move interstate. USDA officials imposed emergency regulations May 8, 1985, on 90 square miles after Medflies, a destructive pest of fruits and vegetables were found in the area.

Unshu Oranges: All Unshu oranges imported into Alaska from Japan must now meet stringent requirements to guard against the possibility of introducing citrus canker into the United States. Formerly, these safeguards concerning growing, packing, inspecting, treating, labeling, and certifying Unshu oranges were not required for those brought into Alaska for consumption there, but were required for those brought into Hawaii, Oregon, Washington, Idaho, and Montana. Unshu oranges are not permitted elsewhere in the United States. Inspections by USDA's Animal and Plant Health Inspection Service have shown that some Unshu oranges imported for Alaskan consumption have been taken to other places in the continental United States. Therefore, the import requirements on these oranges were tightened to protect U.S. citrus-growing areas from citrus canker.

Greenhouse Cucumbers: USDA has updated its 51-year-old grade standards for greenhouse cucumbers to match 1980's technology. The new voluntary standards delete age/maturity requirements from all grades; establish a definition for "injury" by specific defects for U.S. Fancy grade; establish minimum standards for cleanliness, defined as "practically free from dirt or other foreign material"; require that U.S. Fancy grade cucumbers be free from cuts, and the U.S. No. 1 and No. 2 grades be free from unhealed cuts; establish a minimum length that, unless otherwise specified, will not be less than 11 inches; redefine the "standard pack" provision to reflect current packing practices; set forth definitions for "permanent defects" and "condition defects"; and update the format for the standards.

National Dairy Promotion Order: Dairy farmers across the United States have voted overwhelmingly in favor of continuing the Dairy Promotion and Research Order. The continuation was approved by 107,926 dairy producers, or 89.7 percent of those voting. The Dairy and Tobacco Adjustment Act of 1983 required that a nationwide referendum be held to determine whether the order should be continued after September 30, 1985. Only those farmers who were engaged in dairy production during April 1985 were eligible to vote. The order was established to implement a national program for the promotion of dairy products and nutritional education. The program is financed by a 15-cent-per-hundredweight assessment on all milk produced in the 48 contiguous States and marketed commercially by dairy farmers. It is administered by the Dairy Promotion and Research Board, comprised of 36 dairy producers appointed by the Secretary of

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Agriculture to represent the dairy industry.

Turkey Inspection: USDA has adopted an alternate slaughter inspection system for turkeys that is more efficient than traditional inspection and just as effective, according to Donald L. Houston, administrator of USDA's Food Safety and Inspection Service. The new system will allow plant employees to independently trim bruises and other defects after the turkey has passed USDA inspection. Under the traditional method, inspectors identified defects, directed plant employees to trim them, and then verified that the trimming was done properly. The change will allow one inspector to inspect up to 25 light birds per minute (those weighing less than 16 pounds), up from the 20 possible under the traditional method. USDA inspectors will continue to check the outside, inside, and internal organs of all turkeys for signs of disease to determine which birds should be condemned. Plants wishing to be considered for the new system must use a USDA-approved quality control program on their processing line.

Sugar Import Quota: The base import quota for sugar during the 10 months beginning December 1, 1985, will be 1.72 million short tons, raw value. Minimum boatload shipments plus "specialty" sugar imports of 2,000 short tons may bring total quota imports to about 1.85 million short tons, raw value.

Farm Marketing Grants: USDA has awarded grants to the Massachusetts Department of Food and Agriculture and the Iowa Department of Agriculture to help those States develop direct wholesale and retail markets for their farm products. The $50,000 Massachusetts grant will be used to establish a wholesale-retail market outlet in the Worchester area.

USDA has adopted more flexible rules for the Federal inspection of buffalo before slaughter.

The $73,468 Iowa grant will be used to fund surveys of Iowa fruit and vegetable producers to determine their interest in developing centralized post-harvest handling and marketing facilities. The grants were awarded under the USDA's Federal-State Marketing Improvement Program, which provides Federal matching funds to qualifying States for research and experiments in marketing, transportation, and distribution of agricultural products.

Buffalo Inspection: USDA has adopted more flexible rules for the Federal inspection of buffalo before slaughter. Under the new rules, inspection of live buffalo will no longer be required to take place only on plant premises. Instead, USDA inspectors can check live buffalo at three alternative locations: on the producer's premises, outside the transport vehicle at the slaughtering plant, or in a pen at the plant. Also, Federal and cooperating State plants are allowed to use a new triangular brand to indicate inspected and passed buffalo meat and meat products. The triangular brand is to be used instead of the Federal mark traditionally used on inspected and passed red meat animals. USDA provides voluntary inspection services for game animals such as buffalo for a fee. The buffalo industry uses the voluntary program to ensure that buffalo meat and meat products are safe, wholesome, and accurately labeled.

Oriental Fruit Fly: On October 22, 1985, USDA imposed a quarantine in parts of California's Los Angeles and Orange Counties to help prevent the spread of the oriental fruit fly, one of the world's most destructive fruit and vegetable pests. Male and female adult flies and larvae were found in the two mainly residential areas. The quarantine regulations restrict the movement of oriental fruit fly hosts—approximately 100 kinds of fruits, nuts, vegetables, and berries—as well as soil and some other items out of the infested areas. Before any of the regulated items can be moved interstate, a permit must be obtained from USDA. □

Reports of Interest...

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Major Uses of Land in the United States: 1982
Dynamics of Comparative Advantage and the Resistance to Free Trade
Food Consumption, Prices, and Expenditures
U.S. Agriculture's Potential to Supply World Food Markets

Food Spending in American Households, 1980-81 by David M. Smallwood and James R. Blaylock; 144 pp.; July 1985; $5.00; order Stock Number: 001-019-00410-0.

A data source on weekly food expenditures per person, based on the 1980-81 Continuing Consumer Expenditures Survey prepared by the Bureau of Labor Statistics.

Food Cost Review, 1984; 56 pp.; July 1985; $2.00; order Stock Number: 001-019-00411-8.

A wrapup of price changes at the supermarket in 1984. Retail prices of most foods averaged higher in 1984. Farm value of USDA's "market basket" of foods rose 5.3 percent, the first time since 1978 that the farm value increase exceeded the retail food price rise.

Increased Foreign Investment in U.S. Food Industries by James M. MacDonald and Scott A. Weimer; 24 pp.; September 1985; $1.00; order Stock Number: 001-019-00407-0.

Describes recent trends in direct foreign investment in U.S. food industries, emphasizing developments in manufacturing, with secondary attention to other sectors. This report also details the expansion of foreign investment during 1976-82, showing principal industrial directions of foreign investment. Home countries for foreign parent firms are identified.

Food Consumption, Prices, and Expenditures, 1964-84; 125 pp.; December 1985; $4.25; order Stock Number: 001-019-00423-1.

Over 100 tables present the latest annual estimates of per capita food consumption by product, food supplies and utilization, nutrient availability, and retail and producer price indices.

1985 Agricultural Chartbook; 96 pp.; December 1985; $3.50; order Stock Number: 001-019-00428-2.

A valuable research tool, popular teaching device, and convenient format for presenting a complete overview of the agricultural sector. Its 278 charts illustrate data and trends for agricultural subjects ranging from farm income to consumer costs, and from commodities to agricultural trade. Charts showing food programs, cost of production figures, farmland numbers, and population trends round out the picture. Note: An enlargements version of the chartbook, with

each of the 278 charts in reproducible black and white on a page of its own, is also available from GPO for $10.00 per copy. For this version, ask for *Enlargements: 1985 Agriculture Chartbook*, Stock Number: 001-019-00429-1.

Agriculture's Links with U.S. and World Economies by Alden C. Manchester; 60 pp.; September 1985; $1.50; order Stock Number: 001-019-00409-6.

Describes the linkages between farming, the input supplying industries, and the industries manufacturing and distributing farm products. Within the last 30 years, the food and fiber system has found itself increasingly reliant on nonfarm industries and increasingly affected by general economic developments here and abroad.

U.S. Agriculture's Potential to Supply World Food Markets by Clark Edwards; 56 pp.; August 1985; $2.00; order Stock Number: 001-019-00403-7.

Assesses U.S. agriculture's capacity to meet domestic and export demands, and the likely consequences of doing so, under different economic assumptions about the future. By shifting production among regions, adopting new technology, and keeping up the quality of its resources, U.S. agriculture could double its exports within the next 30 years.

Developmental Consequences of Unrestricted Trade by Thomas Vollrath; 20 pp.; May 1985; $1.00; order Stock Number: 001-019-00391-0.

An analysis of the economic forces that determine how trade affects development and growth. International trade, unencumbered by protectionism, stimulates economic growth in both developed and developing countries. Undistorted trade is a catalyst to economic growth because it unleashes market forces that promote development.

World Indices of Agricultural and Food Production, 1975-84; 180 pp.; June 1985; $6.50; order Stock Number: 001-019-00408-8.

Presents indices of total and per capita agricultural and food production for 1955-84 and production data for 1975-84 for 11 countries, 12 regions, and the world. World agricultural production grew at a compound annual rate of 2.4 percent since 1955, while the rate on a per capita basis was only 0.5 percent.

Dynamics of Comparative Advantage and the Resistance to Free Trade by Thomas Vollrath; 28 pp.; August 1985; $1.00; order Stock Number: 001-019-00396-1.

Presents possible trade strategies for both developing and developed countries and discusses their implications for U.S. agriculture. The income gap between developed and developing countries could narrow if the economies of developing countries become more responsive to market forces. Primary manufacturing has become the fastest growing component of many developing countries export growth. This report cites 26 developing countries which have built industries to produce and export basic manufactured products.

Major Uses of Land in the United States: 1982 by H. Thomas Frey and Roger W. Hexem; 36 pp.; June 1985; $1.25; order Stock Number: 001-019-00398-7.

Discusses the major uses of the Nation's 2.3 billion acres of land in 1982: cropland, 469 million acres; grassland pasture and range, 597 million acres; forest land (exclusive of areas in special-purpose uses), 655 million acres; special uses, 270 million acres; and miscellaneous other land, 274 million acres. Changes in cropland and pasture acreages were barely perceptible during 1978-82. Forest land (except special use areas) and miscellaneous other land decreased sharply as large acreages in these categories were reclassified as parks, wilderness areas, and related uses.

Rural Development Perspectives; 3 issues per year; averages 44 pages per issue. Annual subscription: $10.00 domestic, $12.50 foreign.

Shows the practical application of research in rural banking, aging, and housing, the nonmetro labor force and poverty, and farm policy impacts on rural areas. This periodical conveys in a crisp, nontechnical manner the chief results of current research on rural areas. □

In the News...

The aim of agricultural research is an abundant supply of high quality food and fiber. There are always new challenges. Following are selected food research projects being conducted by USDA's Agricultural Research Service.

National Consumers Week

"Consumers Rate Quality" is the slogan for the April 20-26, 1986, observance of National Consumers Week. This is a declaration that consumers deserve quality products and services, as well as set quality standards with their marketplace dollars—a theme familiar to savvy businesses and consumers.

National Consumers Week is the time officially designated each year to recognize and promote the role of consumers in our competitive free enterprise system. The week provides an opportunity for schools, consumer and community groups, businesses, and government to highlight existing consumer offices, programs, and services, raise awareness of consumer education and information materials, and launch new activities. The goal of National Consumers Week is to generate or enhance working relationships that improve the standing or functioning of consumers year round.

A free publication, *How to Run a Consumer Week*, is available by calling toll-free 1-800-325-7272.

Vitamin C May Help Postpone Cataracts

Postponing cataracts through diet may be possible, according to recent USDA research. Sunlight and oxygen damage the unique light-transmitting proteins of the eye's lens. The damaged proteins clump together clouding the lens. As people age, the enzymes that apparently clear away the damaged proteins become less effective, and cataracts form.

USDA research shows that vitamin C and other "antioxidants" can protect the lens proteins from damage, while magnesium and manganese greatly enhance the ability of certain enzymes to dispose of the damaged proteins. These findings may lead to dietary recommendations that retard formation of cataracts.

Chromium-Deficient Diets Can Be Harmful

Chromium is far more important than once suspected in maintaining the body's ability to properly metabolize glucose and fats. Long-term deficiency can lead to adult-onset diabetes and cardiovascular disease. Recent chemical analyses show that most American diets are low in chromium.

Many foods with little or no processing—fresh fruits, vegetables, meat, and whole wheat products—provide ample chromium. USDA scientists found that runners excrete large amounts of chromium on days they exercise, indicating a need for high-chromium foods for this group. Also, diets high in simple sugars (glucose, fructose, and sucrose) cause people to lose chromium compared with diets high in complex carbohydrates (starchy foods and vegetables).

Measuring Body Fat

Body-fat monitoring is gaining popularity in health clubs as Americans become obsessed with the lean look. Some people may, in fact, be harming themselves by reducing too much, shedding necessary fat stores. Women, for example, can become infertile at excessively low body-fat levels.

Generally, men should have a 10-20 percent body fat content and women 20-30 percent, with 15 percent considered the norm for both. Scientists of USDA's Agricultural Research Service are testing the accuracy of several popular new methods for measuring body fat.

A New Tool for Wheat Breeders

A simple nondestructive flotation technique that requires only water, sugar, and salt can select wheat seeds containing the most protein, according to USDA scientists. Beginning with high-yielding kernels, a breeder can skim off the top 1 percent for protein content by adjusting the solution. The technique is an especially useful tool for wheat breeders in developing countries where laboratory facilities are limited or nonexistent.

Pesticide Residue Detection Made Easier

A test based on rabbit blood serum can detect pesticides in soil, water, food, and other materials. This simple, inexpensive test, developed by scientists at USDA's Agricultural Research Service, could help government and private agencies monitor pesticides rapidly and accurately. With the help of special equipment, 96 samples can be analyzed in seconds. A totally automated system could analyze 2,000 samples a day.

Longer Shelf Life for Beef

Predicting the shelf life of hamburger can help meat buyers and sellers ensure high-quality meat. An assay technique has been developed to forecast spoilage based on the amount of lactic acid found in ground beef. Once coarsely ground beef is reground and exposed to air, the bacterial environment changes from predominantly lactic acid-producing bacteria to the kind of bacteria that cause spoilage. The beef is sampled just before it is reground and stored again. Although spoilage during storage of ground beef in the air does not come from lactic-acid producing bacteria, the more lactic acid in the sample initially, the more severe subsequent spoilage. □

National Food Review Index

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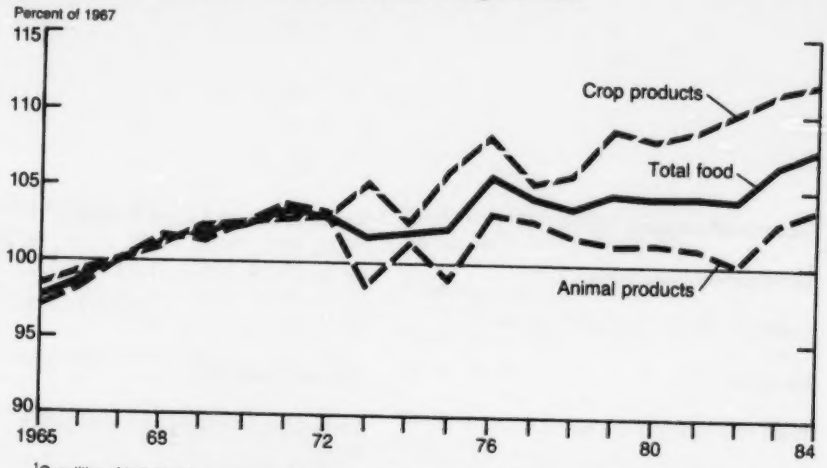
Per Capita Food Consumption Index

Per capita food consumption continued slowly upward during 1984, reaching a record high at 7.5% above 1967's level. The relative components of that consumption, however, have changed somewhat over the years (see Karen Bunch's article on page 1 of this issue). Generally, foods produced from crops have shown larger consumption gains than animal products.

Food Consumption Index Reaches Record High in 1984[1]

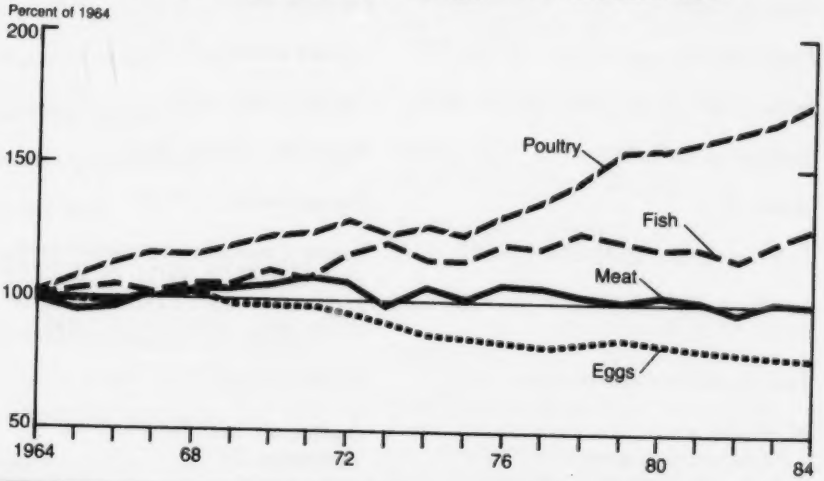


[1]Quantities of individual foods on a retail-weight basis are combined with indices using constant retail prices.

Meat, Poultry, Fish, and Eggs

Per capita red meat consumption declined slightly in 1984, while poultry and fish continued to make relative gains in American diets. Poultry showed the greatest gain—up 74% since 1964. In 1984, per capita red meat consumption was near its 1964 level, but eggs were down 18%. Fish has shown rapid gains since its last decline of 1979-82.

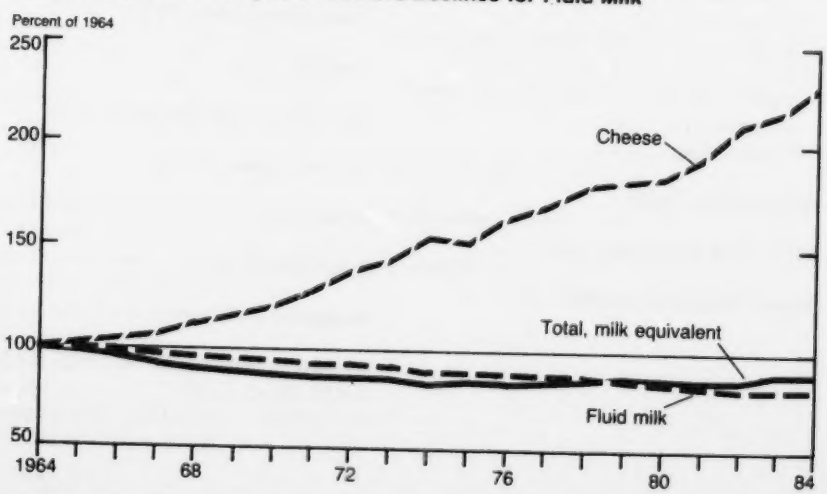
Per Capita Poultry Consumption Up 74%, Eggs Down 18% Since 1964



Dairy Products

Per capita cheese consumption continued to rise rapidly in 1984, offsetting depressed fluid milk consumption for a slightly higher total, milk equivalent, dairy product consumption rate. Fluid milk is now at 83 percent of its 1964 level, while cheese consumption has more than doubled.

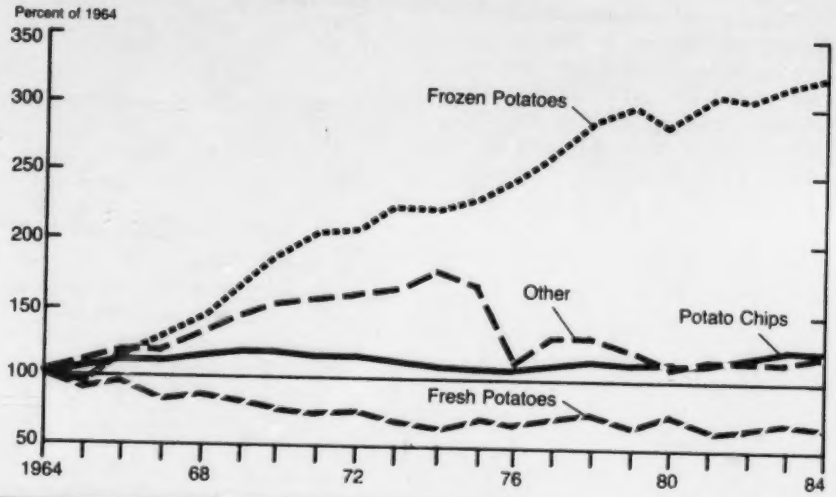
Rising Cheese Consumption Counters Declines for Fluid Milk



Potatoes

Frozen potatoes registered the greatest increase of all potato categories over the last 20 years. Per capita consumption in 1984 reached 322% of 1964's level. Potato chips were unchanged in 1984, while "other" potatoes (flaked, etc.) rose slightly but remained well below the consumption levels of 1968-1978. Fresh potatoes were down. Americans, on average, consume about 30% fewer fresh potatoes than they did in 1964.

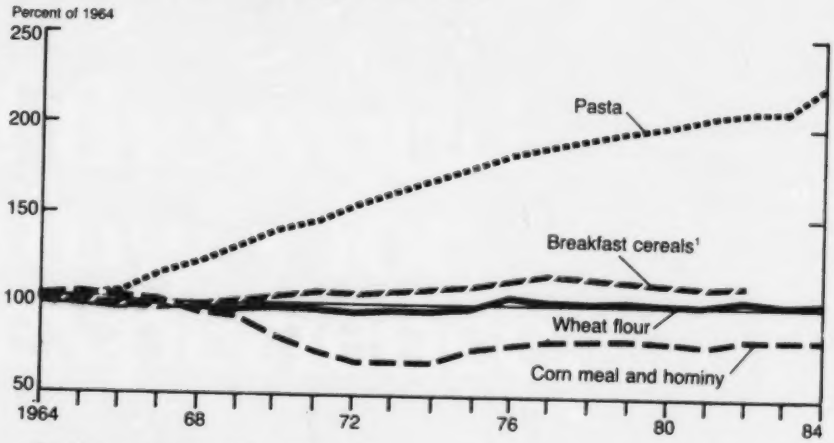
Frozen Potatoes Show Biggest Gain Since 1964



Grain Products

Pasta consumption increased 124% per capita during the past two decades and is still gaining rapidly. Consumption of wheat flour, by comparison, has remained very stable over the period. Per capita corn meal and hominy consumption remained unchanged from 1982 to 1984 at 83% of its 1964 level.

Pasta Continues Its Rapid Consumption Gains

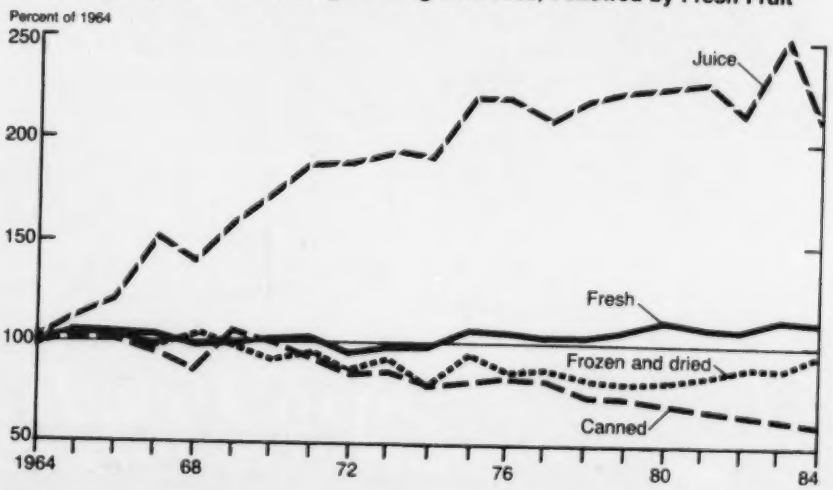


¹Breakfast cereal data not available for 1983 and 1984.

Fruit

In 1984, fresh fruit consumption per capita dropped slightly but remained more than 10% above 1964's level. Juice consumption declined from 251% to 213% of its 1964 rate—a dramatic dip from 1983's record high. Frozen and dried fruit per capita was up slightly, moving from 90% of the 1964 rate in 1983 to 96% in 1984. Canned fruit was down again, slipping to 60% of 1964's per capita consumption level.

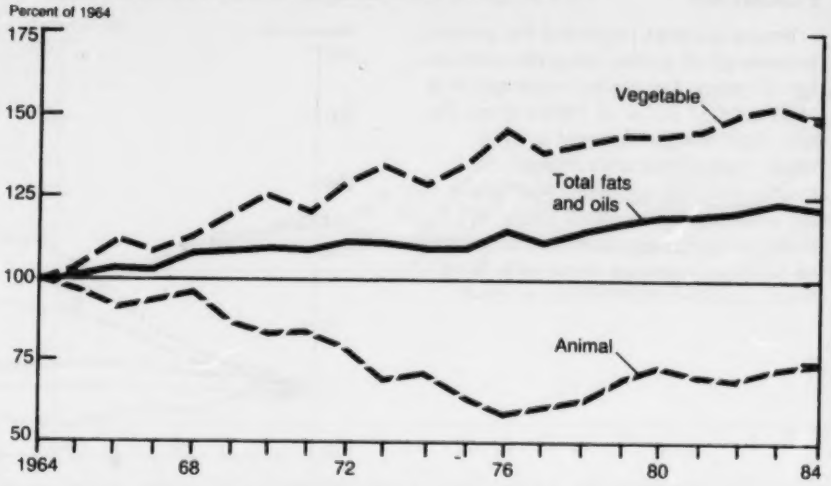
Juice Consumption Shows Largest Long-term Rise, Followed by Fresh Fruit



Fats and Oils

Fats and oils consumption per capita turned down slightly in 1984 as vegetable fats and oils pulled down the average. Use of animal fats and oils, while at only three-fourths of the 1964 level, actually moved up slightly on a per capita basis.

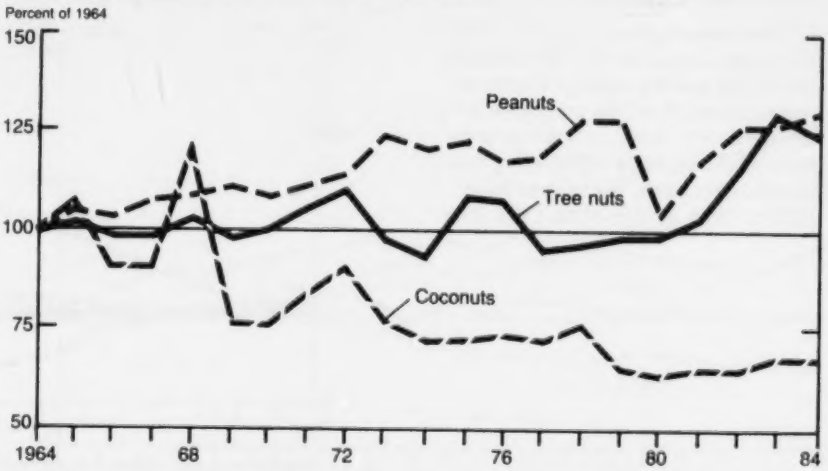
Vegetable Oil Consumption Takes the Lead Since 1964



Nuts

Peanut consumption per capita continued its recovery from depressed 1980 levels. Consumption of tree nuts in 1984 was off slightly, while per capita coconut consumption held steady. Per capita consumption of coconuts has declined over 30% since 1964. Peanut consumption has increased 30% since 1964.

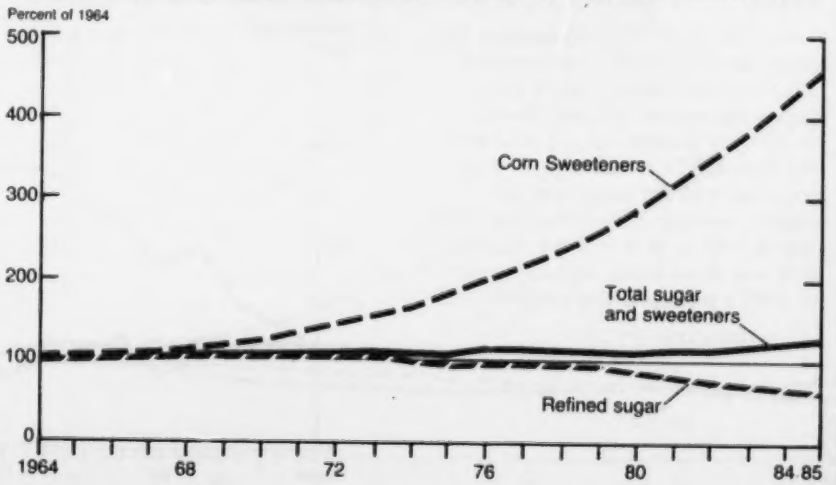
Peanuts Up in 1984, While Tree Nuts Decline



Sweeteners

Corn sweeteners have been one of the success stories of the food industry, and the upward growth continued strong in 1985 as per capita consumption reached 464% of 1964's level. Refined sugar has paid the price of corn sweeteners' success, having lost steadily since 1977 and now at less than two-thirds of the level of 20 years ago. Total sugar and sweetener consumption per capita has inched up slowly during the 1980's, and that trend continued in 1984 and 1985.

Corn Sweetener Consumption in 1985 Was Nearly 500% of 1964's Level



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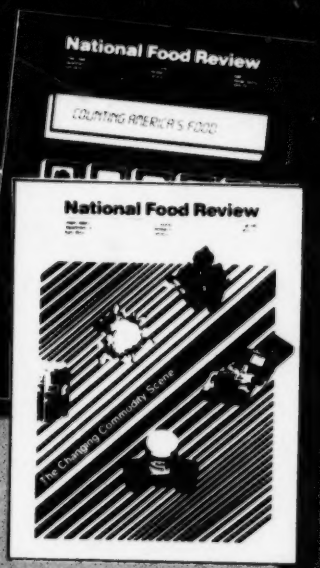

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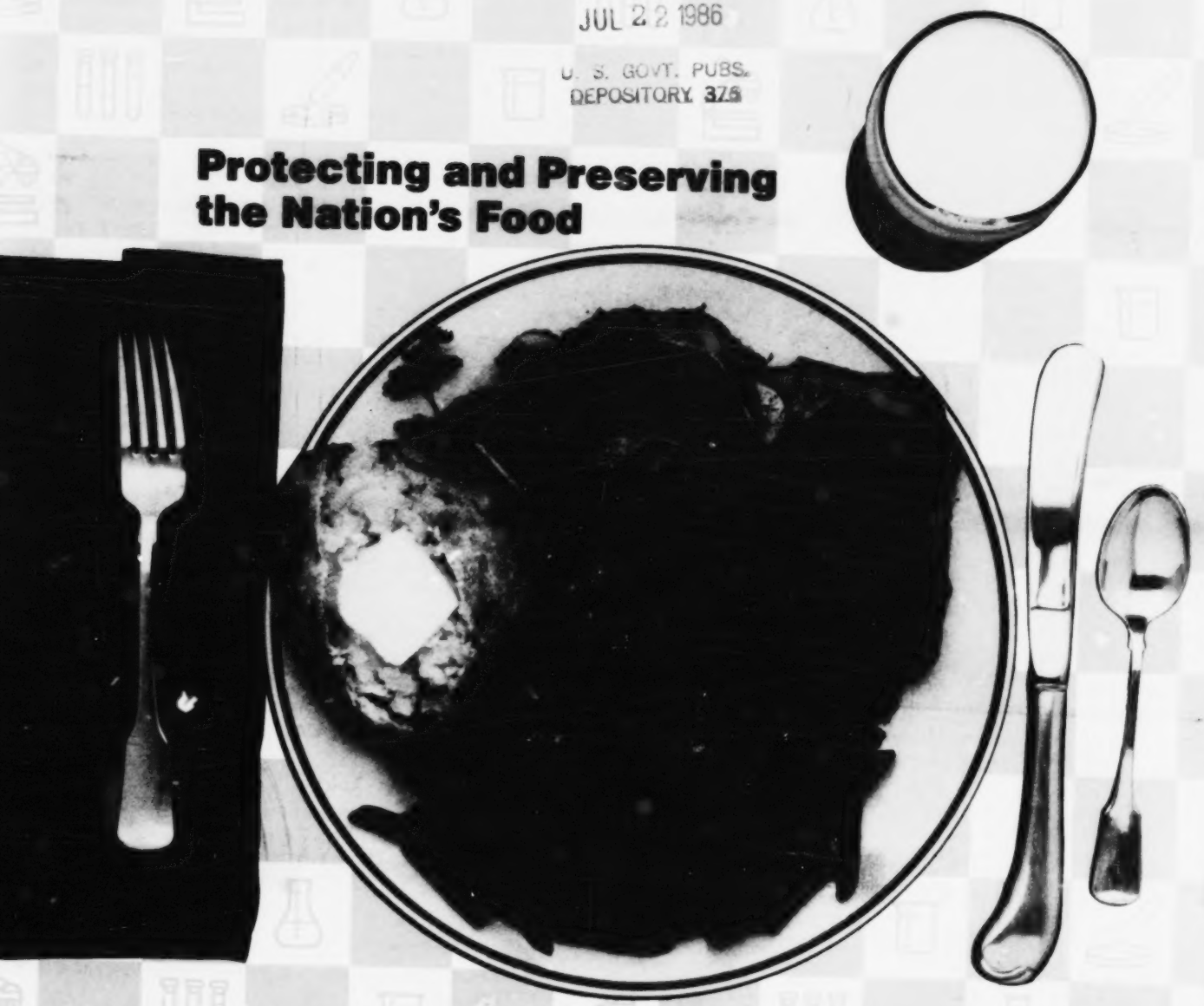

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Irradiation's Potential for Preserving Food

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Scientists have known for many years that radiation can be used to kill insects or destroy microorganisms that cause food spoilage. The process, called irradiation, has been little used, however, largely because of the availability of other preservatives and fumigants and the lack of regulatory permission. The only irradiated foods currently available to U.S. consumers are spices and dried vegetable seasonings, most of which are used in processed foods.

Food irradiation is receiving renewed attention, partly, because of a recent Food and Drug Administration (FDA) action that expanded the list of foods that can be legally irradiated *(see sidebar box)* and because of continued concerns about the safety of chemical fumigants. Further adoption of the process will depend on its costs and benefits relative to existing preservatives and fumigants; the future of current alternative treatments, particularly those that rely on chemicals; FDA's approval of the process for more uses; and consumer acceptance of irradiated foods.

An ERS researcher recently took a close look at the cost of irradiating selected foods at various size plants. She found that costs varied from 8.5 cents per pound for a facility designed to irradiate small volumes of fish fillets to 0.2 cent per pound for an irradiator treating a large volume of pork. Costs, in general, varied with the dose of radiation absorbed by the product and the size of the irradiator. Furthermore, the ERS study revealed that the cost per pound declines as the volume irradiated annually increases. This suggests significant per unit cost reductions for small irradiators as they increase in size. Irradiators treating more than 50 million pounds a year, however, are not likely to realize such significant economies.

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A storage pool of water is used to protect scientists from radiation at the National Marine Fisheries Service's irradiator at Gloucester, Mass.

Irradiation Effects Depend on Dose

Irradiation sterilizes and preserves food by using gamma rays from radioactive isotopes, high-energy electrons, or X-rays. The energy levels of the radiation from these sources, used in accordance with FDA restrictions, will not make the food radioactive.

The effects of radiation depend on the dose absorbed, usually measured in kilorads (krads) *(table 1)*. Low doses of 5 to 100 krads sterilize adult insects and kill insect eggs and larvae. This range also extends shelf life by delaying ripening of tropical fruits and sprouting in root crops, such as potatoes and onions. A low dose sterilizes the trichinosis-causing parasite so that it does not pose a serious health threat. Irradiated pork does not need to be heated, refrigerated or frozen, or cured to kill this parasite.

Irradiation might replace potentially hazardous chemicals used to disinfest agricultural commodities when recontamination is not a problem, such as satisfying quarantine requirements. For example, growers in Hawaii are considering it as a substitute for the banned ethylene dibromide (EDB) previously used to rid papayas of fruit flies before shipment to the continental United States. Although FDA has approved irradiation of fresh fruits and vegetables, USDA's Animal and Plant Health Inspection Service must officially recognize irradiation as an effective quarantine treatment before it can be used for this purpose.

Medium doses of 100 to 1,000 krads extend the shelf life of treated foods by reducing the number of spoilage microorganisms. For example, radiation treatment can extend the refrigerated shelf life of fresh fish by 7 to 10 days. This dose range also inhibits postharvest fungi development in fruits and reduces microorganisms that pose public health threats, such as salmonellae *(see related article in this issue)*. However, medium doses have not been approved by FDA.

Similarly, high doses of radiation—2,300 to 5,700 krads—are not allowed for commercial use. These doses, combined with heating, enable food to be stored in sealed containers at room temperature for years. Irradiation sterilizes food by killing microorganisms, including the organism that produces botulism toxin, while preheating kills viruses and other bacteria and inactivates enzymes that cause food to decompose during storage. Irradiation-sterilized meats and seafood have superior texture and nutritional content comparable to conventional canned foods.

Other improvements are possible: reduced nitrite levels in bacon; increased loaf size for bread made from irradiated wheat; ten-

Table 1. Irradiation Has Benefits and Limitations

Suggested dose in krads	Benefits	Limitations
5-75	Sterilize insects.	Reinfestation possible. Insects still able to feed.
5-15	Inhibit sprouting of root crops and elongation of asparagus.	Potatoes must cure before irradiation.
10-75	Delay ripening of some fruits.	Successful for limited number of fruits.
30-50	Inactivate parasites in meat.	Still need refrigeration.
100-200	Kill spoilage microorganisms in fish and fungi in fruits.	Recontamination possible for all foods. Foods still need refrigeration.
200-400	Reduce microorganisms causing public health problems in meat and poultry.	Above certain doses, softening, pitting, and other problems for fruits. Above certain doses, off-flavor and color problems for meats and poultry.
2,300-5,700	Sterilize food for unrefrigerated storage.	Must be irradiated frozen to minimize undesirable changes in quality.

derization of beef; shortened rehydration time for dehydrated vegetables; faster aging of red wines; and reduced gas-causing sugars in beans.

Is Irradiation Cost-Effective?

To be used widely as a food preservation technique, irradiation must compete with alternative treatments by achieving the same effect at a lower price or with fewer drawbacks. If the process costs more, it may still gain acceptance if processors or consumers value the benefits enough to pay the extra cost.

The beginning point in answering the question of irradiation's economic feasibility is to determine the cost of the process and then compare it with the value of the benefits, as well as the cost of substitute processes. The ERS study examined irradiation costs to determine if the cost of the treatment per unit of output falls as plant size increases, a concept known as economies of scale.

Costs were estimated for irradiating fish fillets and strawberries to extend shelf life, papayas to satisfy quarantine requirements, chicken to kill food-poisoning microorganisms, and pork to sterilize the trichinosis-causing parasite. These applications were chosen to illustrate how unit costs vary with dosage and irradiator size. Costs were estimated for irradiators treating a single commodity for a specific purpose. Cobalt-60 was selected as the radiation source because it is used for irradiating foods in Europe, Japan, and South Africa. Facilities that use other radioactive isotopes, such as cesium-137, or machine-produced radiation would require a separate cost analysis.

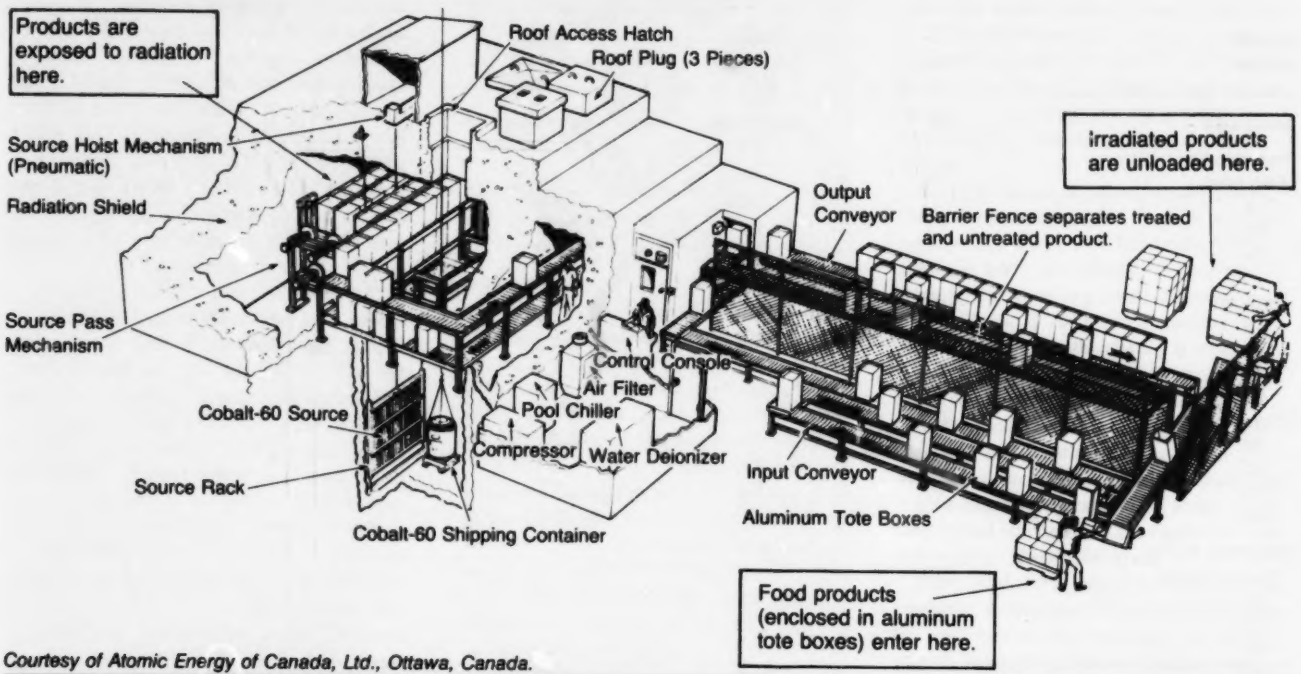
Since very few commercial irradiators treat only food, the ERS study results represent estimates for hypothetical facilities of a range of sizes. Capital and operating costs were estimated for model irradiators based on information from builders and operators of commercial irradiation facilities used for industrial purposes, mostly to sterilize disposable medical supplies. The ERS estimates, therefore, provide an idea of the magnitude of irradiation treatment costs and how they might vary with plant size. The actual cost of irradiating a specific food will depend on the required dose, the food's tolerance of radiation, construction costs, land prices, wages, financing arrangements, and other variables which vary by locality.

The major components of a gamma irradiator include shielding to protect workers and the general public from exposure to radiation; a conveyor system to move the food past the radiation source; and various auxiliary systems to remove excess heat and vent out the ozone produced *(see diagram)*. In addition, space is needed for an equipment room, a laboratory for quality control testing, and product loading and unloading areas. A free-standing irradiator that is not attached to a packing house or filleting plant would need to have refrigerated storage space to hold products before and after irradiation, unless trucking schedules could be coordinated with the irradiation timetable. In contrast, an irradiator that is integrated into a plant could use the existing storage space.

Unit costs for all five commodities decreased as the irradiator's capacity or size doubled, but the amount of the decline depended on the size of the irradiator. The per pound cost of irradiating fish fillets, for example, fell from 8.5 cents for a facility handling 6 million pounds annually to 4.5 cents for 12 million pounds, and 1.6 cents per pound for 48 million pounds annually *(table 2)*. In contrast, increases in the annual capacity for large, integrated chicken irradiators, from 52 million to 104 million pounds, lowers per pound cost for irradiation from 1.6 cents to 1.2 cents, with cost dropping to 1.0 cent per pound for a facility handling 208 million pounds.

The ERS study results suggest that, considering only the treatment cost, larger ir-

Diagram of Cobalt-60 Irradiator



Courtesy of Atomic Energy of Canada, Ltd., Ottawa, Canada.

radiators would be able to treat products at a lower unit cost than small facilities. Potential economies of scale were substantial for irradiators with a capacity of less than 30 million pounds a year. Owners of this size irradiator or smaller would be at a distinct cost disadvantage when faced with direct competition from large, low-cost firms. However, potential unit cost reductions as size increased became less pronounced at annual capacities greater than 50 million pounds. For an industry such as papaya packing, reaching this production level would require consolidating the output of several firms. However, in the chicken-packing and hog-slaughtering industries, 80 percent of production is already handled by firms of this size or greater.

Irradiators are likely to operate at less than capacity part of the year if they are used for seasonal products such as fruits and vegetables. Even commodities grown year-round, like papayas have definite seasonal harvest patterns. To accommodate seasonal peaks, irradiators would have excess capacity during off periods. Excess capacity results in higher unit cost because large irradiators treating small volumes of products would have less output over which to spread their high fixed costs.

For example, the ERS study found that if 50 million pounds of strawberries were treated in a facility designed for that annual volume, the unit cost would be close to 2 cents per pound. A plant built to handle 100 million pounds, but only treating 50 million pounds, would incur a unit cost of 3 cents per pound. If an irradiator designed for 200 million pounds only treated 50 million pounds of strawberries per year, unit cost would be above 5 cents per pound. Locating an irradiator in an area with sequential harvest times for different irradiation-compatible commodities, or irradiating nonagricultural items during off seasons, would lessen this under-utilization problem.

The ERS study estimated only the costs for the radiation treatment. For free-standing facilities that combine production from several sources, shipping the commodity to the irradiator would be an added cost. As free-standing irradiators increase in size, they will have to draw on larger geographic areas for their annual volume. The transportation costs of getting the commodities to the larger irradiator may outweigh any gains in production economies. This may bring the total cost of using a small irradiator more closely in line with that of a large irradiator.

Competitiveness with Alternatives

For commercial success, irradiation must compete with alternative food treatments both in terms of cost and acceptability to food safety regulators, processors, retailers, and consumers. Irradiation must offer sig-

Table 2. Investment and Unit Costs for Selected Cobalt-60 Irradiators[1]

Annual volume	Dose	Initial investment[2]	Irradiation unit costs[3]
Million pounds	krad	Million dollars	Cents per pound
Free-standing facility			
Fish fillets	175		
6		1.0	8.5
12		1.1	4.5
24		1.4	2.6
48		1.9	1.6
Papayas	26		
12		1.0	4.2
24		1.2	2.3
48		1.5	1.4
96		2.4	1.0
Strawberries[4]	200		
25		2.0	2.7
50		3.4	2.1
100		5.8	1.7
200		10.5	1.5
Integrated facility			
Young chicken	250		
52		2.0	1.6
104		3.3	1.2
208		6.0	1.0
416		11.2	0.9
Pork[5]	30		
66.5		.9	0.7
133		1.1	0.4
266		1.6	0.3
532		2.5	0.2

[1]Costs in this study are based on a specific set of assumptions and input prices listed in "Economies of Scale in Single-Purpose Food Irradiators" (see references). [2]Investment items include: cobalt-60, biological shielding and other building space, irradiator machinery and auxiliary systems, product-handling equipment, refrigerated warehouse space, design and engineering, land, and working capital. [3]Treatment costs are for irradiators processing the hourly volumes for which they were designed and operating three shifts a day, 5 days per week. [4]Irradiators operate 7 days a week for 4 months of year. Radiation safety officer, shift supervisors, and plant operators receive 30-percent bonus to compensate for part-time employment; plant manager is hired for full year to maintain irradiator when not in use. [5]Split pork carcasses are assumed to move through the irradiator suspended from a monorail track. Therefore, machinery and product-handling costs are different than for the other foods.

nificant quality-enhancing benefits or cost savings for a firm to abandon existing, satisfactory processes. A 1984 USDA report for the U.S. House of Representatives' Committee on Agriculture estimated per pound costs for fumigating Hawaiian papayas. Chemical fumigation was estimated to cost less than 1 cent per pound, compared with ERS irradiation estimates of 1 to 4.2 cents *(table 2)*. Just looking at treatment costs, however, can be misleading. Growers must also consider any supplementary costs, such as marketing delays, damage to the fruit, or undesirable fruit quality.

In estimating the total cost of irradiation, the costs of additional handling need to be considered. For example, as long as chemical sprout inhibitors applied in the field are permitted, it is unlikely that irradiation will be used on potatoes because of the costly extra handling step needed to bring them out of storage for the radiation treatment.

Irradiation Has Limitations

While irradiation offers a range of benefits, it does have limitations. The dose needed to kill insects or microbial pests in agricultural products, for instance, often causes undesirable changes in treated foods. Irradiating fresh produce can cause softening, sensitivity to chilling injury, rot, and uneven ripening. For example, irradiation interferes with a potato's ability to heal cuts and bruises received during harvest, thus increasing rotting. Potatoes must be irradiated after a sufficient curing time.

Problems also arise when irradiation moves from laboratory conditions to the field or slaughterhouse to treat large quantities commodities that are less than perfect and not uniform in size, firmness, and other characteristics. Radiation tends to damage living cells and may accentuate any flaws or cause other undesirable changes. Radiation's exact effects on produce depend on a commodity's variety, rainfall and fertilizer received, maturity at harvest, postharvest handling, and other factors. Often, irradiation must be done shortly after harvest or slaughter before the microbial load is too large. And, in the case of low and medium dose treatments of meat, fish, and some fruits, the irradiated product still requires refrigeration to extend shelf life.

An important limitation is that radiation kills only those insects and microorganisms in the food during exposure. There are no residues to fight recontamination. Unless protective measures are taken, such as adequate packaging, the irradiated food can be reinfested.

Doses of 175 to 200 krads are needed to inhibit postharvest fungi that can contaminate fruits and vegetables and lead to storage decay. However, 225 krads is near the maximum that can be used on most fresh produce without softening and other problems. Studies on 27 fruits indicate that irradiation can only be used to control storage decay (without damaging the fruit) in tomatoes, strawberries, and figs. For papayas, scientists have successfully lowered the dose to 75 krads by combining it with a hot water dip. This combination

Focus on the Status of Food Irradiation

A 1958 amendment to the Federal Food, Drug, and Cosmetic Act specifically includes "any source of radiation" used in processing or packaging food in the definition of a food additive. Thus, processors must comply with the U.S. Food and Drug Administration (FDA) regulations prescribing safe use of radiation to treat foods or petition FDA for new uses.

Last summer, FDA added dried enzymes (food processing aids) and fresh pork to wheat, flour, and white potatoes approved in the early 1960's. FDA approved the treatment of pork carcasses and fresh cuts of pork at doses between 30 and 100 krads to control the parasite that causes the disease trichinosis in swine and humans.

USDA's Food Safety and Inspection Service (FSIS) is responsible for ensuring the safety and wholesomeness of meat and poultry products sold in the United States. Therefore, irradiation of pork, or any meat or poultry product, must also be approved by FSIS. In January 1986, FSIS amended the Federal meat inspection regulations to allow irradiation of fresh or previously frozen pork at the same dose level as FDA.

Until now, permission to irradiate specific foods has been granted or denied in response to individual petitions submitted to FDA. However, FDA can also grant permissions for broad categories of food at the Agency's own initiative. On April 18, 1986, FDA issued a final rule allowing processors to use doses up to 100 krads to inhibit growth and maturation of fresh foods and to disinfest foods. This rule also raises the level permissible to kill microorganisms in spices and dried vegetable seasonings from 1,000 to 3,000 krads.

FDA requires that retail packages of irradiated foods carry a logo *(see accompanying illustration)* and the statement "Treated with radiation" or "Treated by irradiation." For non-packaged foods, the required logo and phrase must be prominently displayed either on the bulk container or on a placard. The retail labeling requirement does not apply to foods that contain an irradiated ingredient but have not themselves been irradiated. For example, sausage containing irradiated spices would not need the irradiation label. Invoices for irradiated ingredients and products sold to food processors must contain the added phrase "—do not irradiate again." After 2 years, irradiated foods will be required to carry only the logo unless FDA extends the wording provision also.

While FDA has only approved irradiation of foods up to 100 krads (with the exception of spices), other countries allow the 1,000-krad maximum adopted by the Codex Alimentarius Commission in July 1983. The Commission is an international group set up by the Food and Agriculture Organization of the United Nations and the World Health Organization to develop voluntary global food standards. Worldwide approvals and commercial uses of food irradiation were discussed in a previous article *(see NFR-26)*. Extending regulatory approval to the 1,000-krad level would permit irradiation to be used for shelf life extension and public health purposes. The higher doses needed to sterilize food have not been approved by FDA or any other governments.

treatment might hold promise for other fruits.

For meats and poultry, doses above 150 to 250 krads produce off-flavors. At the higher doses needed to sterilize meats and poultry, undesirable off-flavors and aromas are severe, requiring that the product be frozen during irradiation to reduce these changes.

Bacterial spores in meats, poultry, and fish are destroyed only at the high sterilizing doses of 2,300 to 5,700 krads. Thus, adequate safety procedures for handling, storing, and preparing foods exposed to sub-sterilizing doses must be maintained. Another public health concern is to avoid creating an environment where normal spoilage microorganisms are eliminated. Without these microorganisms, pathogens surviving the radiation, or introduced after irradiation, could grow out undetected during the extended storage. This concern has been raised in regard to irradiation of fresh fish at doses above 100 krads.

There is also the unanswered question of consumer acceptance. Consumer acceptance of irradiation in other countries has been mixed. Irradiated potatoes in Japan have met with opposition by consumer groups who question the safety of irradiation for food preservation. However, in South Africa, where irradiated food is not labeled at the retail level and the initial test marketing was accompanied by an extensive educational campaign, irradiated strawberries, herbal teas, and dried foods are successfully sold.

U.S. regulators have decided that irradiated foods must be labeled at retail *(see sidebar box)*. However, the impact of the labeling rule on consumer acceptance is not known. U.S. food companies do not want to risk the good will of their brand names if irradiation is rejected by consumers. At the same time, there could be benefits from being the first to market trichinae-safe pork or salmonellae-free chicken.

Likely Uses and Potential for Preserving Foods

Irradiation has several industrial applications, including sterilizing medical supplies, treating the insulation on wire and cable, and cross-linking plastic food wrap. But

very few of the world's commercial irradiators treat just food. Food irradiation is expected to grow slowly for a variety of reasons and will be used where market conditions—structure of the industry and marketing chain, demand for the benefits, and value of the product—are conducive to its acceptance.

The large volumes needed to achieve low average treatment costs dictate a geographically centralized approach. Firms that do not have the volumes to justify an in-house irradiator may have to join with other firms and build a free-standing, centrally located irradiator to treat their combined volumes. Smaller firms could also use the services of a contract irradiator, if available, who would charge a fee for the irradiation treatment. For free standing and contract facilities, transportation to the irradiator is an added cost.

Along with large volumes, another desirable characteristic is steady, year-round production—not typically the case for most fruits and vegetables. Meat and poultry slaughter, however, have smoother and more controllable production cycles.

Irradiation is more likely to be used in industries where there is a consolidating point early in the marketing chain to avoid additional transportation costs. Products requiring disinfestation before export or shipment are generally assembled at a port or shipping point. For example, 87 percent of the Hawaiian papayas pass through Honolulu to market. This consolidation early in the export chain is one reason irradiation shows particular promise as a quarantine treatment. In addition, reinfestation is not a concern because the treated product is sent to an area free from the particular pest. With the banning of ethylene dibromide (EDB), growers are looking for nonchemical alternatives.

Irradiation to lessen the incidence of foodborne diseases, such as salmonellosis and trichinosis, will depend on either the desire of the food industry to improve consumer acceptance of a product by lessening the potential for disease or the Government's decision to impose stricter standards for microbiological safety.

Radiation-sterilized meats sold in airtight cans or plastic pouches are likely to have a limited market in the United States because of high production costs and established consumer preferences for traditional fresh meats. Canned meats are not high-volume items in U.S. supermarkets. Irradiation costs are likely to be high because of the large dose, supplementary treatments needed to preserve quality, and protective packaging required. Radiation-sterilized meats were developed by the Army as a possible replacement for traditional canned C-rations and may be demanded for specialty uses, such as submarines, space shuttles, and camping trips, where space and weight are important considerations.

Irradiation is likely to continue to be used in the United States for foods that are small components of the diet, such as spices, and dried onion and garlic powders. These items are ingredients in processed food and are not disclosed on the retail label. Also, the small amount consumed may reduce any perceived risk by consumers and regulators. These items tolerate irradiation well (in fact, it preserves flavor and color better than conventional methods).

Spices are high-valued products and can easily fit into the current operating procedures of contract irradiators. By using the services of a contract irradiator, a food company can test technical feasibility and consumer acceptance without undertaking the large investment of an in-house irradiator. Irradiation's use on other products will depend on its technical desirability, cost competitiveness with alternative techniques, and processor and consumer acceptance of the process. □

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Irradiation's Promise: Fewer Foodborne Illnesses?

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Irradiation offers several potential benefits to the food supply. It can substitute for chemical fumigants in disinfesting certain foods of insects. It can delay the ripening of fresh fruits and vegetables and give perishable products a longer shelf life. But one of the most important benefits may involve the use of irradiation to destroy microbial pathogens that enter the food supply.

Public health officials estimate that the Nation's two most common food-related illnesses—salmonellosis and campylobacteriosis—afflict more than 4 million Americans annually. A recent Economic Research Service (ERS) study put the annual cost of the illnesses and deaths associated with campylobacteriosis in chicken, salmonellosis in chicken and beef, and toxoplasmosis in pork at around $1 billion just in medical treatment and lost wages. Canadian researchers found that significant costs were also incurred by food processors and restaurants because of lost sales, product recalls, plant closings, and liability suits during foodborne illness outbreaks. A complete accounting, including the value of lost leisure time, might bring total costs of these three illnesses in the United States to about $2 billion.

Among food products, animal products are one of the primary carriers of pathogens. Irradiating red meats and poultry could significantly reduce the occurrence of five food-related illnesses—salmonellosis, campylobacteriosis, toxoplasmosis, trichinosis, and tapeworm. The Food and Drug Administration (FDA) recently approved the irradiation of pork to prevent trichinosis, and proposals to allow the irradiation of poultry and other meats may be considered within the next several years.

This article reviews available data on the public costs of these illnesses and provides estimates of the economic benefits of irradiating certain meats. The potential economic benefits of reducing food-related illnesses are compared to the costs of irradiating certain foods *(see "Irradiation's Potential for Preserving Food")*. The analysis does not address the issues of consumer acceptance of irradiated foods or the safety of food irradiation technology.

Foodborne Illnesses on the Rise

Current food curing and processing practices fulfill a range of objectives, from enhancing taste and eye appeal to ensuring long shelf life and freedom from impurities and microbial hazards. Rapid and inexpensive testing methods are available to detect only a few microbial pathogens, and few food firms or government inspection systems use these tests for routine monitoring of food production lines. Instead, emphasis is placed on good manufacturing practices, including standard time and temperature guidelines.

Foodborne illnesses, nonetheless, are on the rise. The annual number of reported cases of salmonellosis has doubled in the last 16 years, for example. The causes of this increase are diverse. The greater concentration of animals in larger production and slaughtering units permits easier transmission of disease. More geographic movement of animals means more risk of spreading disease across the countryside. Furthermore, the use in animal feeds of improperly processed animal byproducts and wastes can introduce and perpetuate disease cycles.

Other possible explanations include a greater number of distribution stages from farm to retail, along with the growth in away-from-home meals. These developments have meant more mass production of food and increased the possibility of improper heating and refrigeration—two of the most common contributors to food-related disease in meat and poultry. People are also traveling more and eating a greater variety of foods, increasing their chances of being exposed to more types of foodborne hazards. Finally, the organisms themselves are

The greater concentration of animals in larger production units permits easier transmission of disease.

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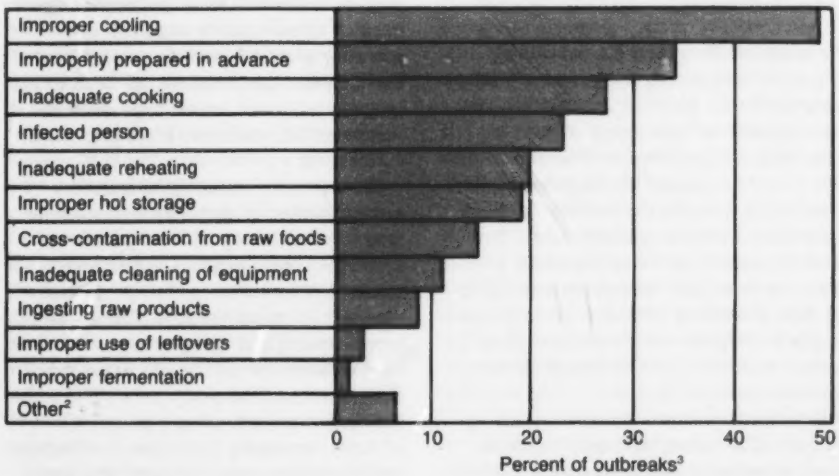
U.S. Outbreaks of Meat- and Poultry-Borne Diseases Have a Multitude of Causes[1]



[1] Average for 1968-77.
[2] Includes improper thawing, improper construction of equipment, inadequate preparation space, abscess on meat, feeding animals mercury-treated grain, and eating sick animals.
[3] Some outbreaks may have had more than one cause.

Source: Bryan, Frank L. "Foodborne Diseases in the United States Associated With Meat and Poultry." *Journal of Food Protection*, vol. 43, no. 2, 1980. pp. 140-50.

evolving by adapting to modern food processing and developing resistance to human drugs.

Salmonellosis and Campylobacteriosis

Two important intestinal diseases, salmonellosis and campylobacteriosis, are associated with chicken, beef, dairy products, turkey, and eggs. Each disease affects an estimated 2 million people annually. Cases are typically characterized by mild abdominal discomfort and diarrhea, but severe illness and even death can and do result.

Researchers at the Centers for Disease Control (CDC) surveyed individuals in a 1976 salmonellosis outbreak in Colorado to determine the costs of the disease. Those who responded listed medical costs and lost wages that averaged $1,290 per person in 1985 dollars. Those who did not report their salmonellosis were assumed to have a milder case with an average cost of $230 each *(table 1)*.

Table 1. Cost Per Case of Foodborne Illness and Death

Illness	Cost per case[1]
Trichinosis	
Illness	$2,485
Death	$140,000-$471,000
Congenital toxoplasmosis	
Average illness[2]	$130,303
Salmonellosis/ campylobacteriosis	
Mild illness	$230
Moderate illness	$1,290
Death	$85,800-$351,500
Tapeworm	
Illness	$111

[1]Updated to 1985 prices. [2]Fetal deaths excluded.

Chicken was the direct cause of 9.5 per cent of the outbreaks of salmonellosis reported to CDC in 1981. In recent years, salmonellosis attributable to beef has become more common. In 1981, 31 percent the outbreaks reported to CDC were caus by beef. Although turkey is also a major source of salmonellosis, it was excluded from the ERS analysis because irradiation doses required to kill the salmonellosis-causing bacteria causes off-flavors in the product.

Around 40,000 cases of salmonellosis a reported to CDC annually. At $1,290 for each of the 3,800 chicken-related cases, t cost is $4.9 million annually. However, a another $42.8 million ($230 per case in medical expenses and lost wages) based o the assumption that chicken is responsible for 9.5 percent of the total estimated 1.96 million mild cases annually not reported t the CDC.

The death rate from salmonellosis is on in 1,000 cases, or 2,000 persons annually Again, chicken is assumed to be the sour of 9.5 percent of these deaths. Various methods can be used to measure, in strict economic terms, the costs of those deaths Using the actual age distribution of death due to salmonellosis, estimates range fro $85,800 per life to $351,500, depending the method used. These estimates provide total loss from chicken-caused salmonello of between $64 and $115 million annually *(table 2)*.

Using the costs per case developed for chicken-related salmonellosis, the 31 perc of deaths and mild cases related to beef consumption are estimated to cause from $209 million to $374 million worth of me ical expenditures and wages lost every ye

Data on the number of cases of campylobacteriosis are incomplete, but all recent studies indicate that it is a slightly more common cause of intestinal disease than salmonellosis. The CDC estimates there are 2.1 million cases annually in the United States and that the fatality rate is one per 1,000 cases. A study of campylobacteriosis in the Seattle area found t the treatment and total length of illness were similar to salmonellosis. Consequent

Table 2. Health Costs and Wages Lost to Disease

	Low estimate	High estimate
	Million dollars	
Pork		
Trichinosis	1.5	2.8
Congenital toxoplasmosis	215	323
Chicken		
Salmonellosis	64	115
Campylobacteriosis	362	699
Beef		
Salmonellosis	209	374
Tapeworm	0.1	0.1
Total[1]	850	1,500

[1]May not add because of rounding.

ly, the costs of $1,290 for moderate cases of salmonellosis and $230 for mild ones are also applicable for campylobacteriosis.

Most commercially raised poultry have species of campylobacter in their intestines. Intestinal spillage during processing is considered to be the principal cause of contamination. Chicken was associated with about half of all cases of campylobacteriosis in the Seattle study. Thus, the ERS study assumes that chicken causes half of the cases, and half of the deaths, in the United States.

The Seattle incidence was 71.5 cases diagnosed per 100,000 population, compared with a Denver study citing 24.4 cases per 100,000. These rates of infection nationally would result in from 57,340 to 168,025 cases of moderate severity per year. Campylobacteriosis caused an estimated 2,100 deaths. The remainder of the estimated 2.1 million cases are assumed to be mild and evaluated at $230 each. The total illness and death costs, thus, are estimated to range from $362 to $699 million for chicken-related campylobacteriosis.

Toxoplasmosis and Other Illnesses

Toxoplasmosis arises from eating undercooked pork or, in rare instances, from handling raw pork. Soil contaminated with cat feces is another common source of the disease. Public health researchers suggest that pork causes half to three-quarters of the thousands of U.S. cases annually.

Toxoplasmosis can take a variety of forms, from mild to life-threatening. Healthy adults with normal immune systems typically fight off the disease with no symptoms. However, fetuses do not have well developed immune systems. If a pregnant woman becomes infected, there is a 20- to 40-percent probability that her child will be infected. Surviving babies are likely to suffer eye damage or mental retardation. An estimated 3,300 babies born every year in the United States are infected. Two Stanford University researchers estimate the lifetime medical, special schooling, and foster care costs for the children surviving toxoplasmosis at $430 million each year (in 1985 prices). The medical costs and lost wages associated with mental retardation and eye problems in babies due to toxoplasmosis from pork are estimated at $215 to $323 million annually.

FSIS Meat and Poultry Hotline

On July 1, 1985, USDA's Food Safety and Inspection Service (FSIS) launched a nationwide toll-free Meat and Poultry Hotline *(see related article in this issue)*. Specially trained home economists staff the hotline, and will answer questions on how to properly handle meat and poultry, how to tell if it's safe to eat, and how to better understand product labels. The hotline can also be called to report problems with meat and poultry products, such as foreign objects or a strange odor.

The toll-free number is 800-535-4555 (in the Washington, D.C., area, call 447-3333). These numbers are accessible *by telecommunications devices for* the deaf. The hotline operates from 10 a.m. to 4 p.m. (eastern time) Monday-Friday, except holidays.

Human cases of trichinosis have declined dramatically in the United States, although more than 100 cases a year are reported. The consequences of trichinosis vary from asymptomatic illness to death, depending largely on the number of live larvae ingested. Pork is responsible for the majority of cases, but ground beef can also become contaminated when the same grinders are used to process both beef and sausage. Data suggest pork causes about 560 cases a year, with most cases unreported.

To estimate medical costs and lost wages associated with trichinosis, ERS researchers used a 1975 outbreak affecting 17 people as a sample. In 1985 prices, the per patient expense was $2,485. Using this figure for the estimated 560 annual cases results in $1.4 million per year for pork-related cases of trichinosis. Deaths add another $100,000 to $800,000, depending on the measure used to assign an economic value to human life.

Tapeworm is carried in beef, pork, and lamb. Eating a live larvae that has not been killed by thorough cooking will infect a person. The CDC estimates that 1,000 beef tapeworm cases occur annually in the United States. Typically the symptoms are mild. The medical costs and lost work time for visits to the doctor are estimated at $111 per case. Nationwide, the annual cost related to the beef tapeworm is estimated at slightly more than $100,000.

Irradiation Could Reduce Illness

Irradiation is a process that could sharply reduce occurrences of—and costs relating to—these foodborne illnesses. In July 1985, FDA approved the treatment of pork carcasses and fresh cuts of pork at doses between 30 and 100 krads to control the organism that causes trichinosis. Irradiating pork carcasses at 50 kilorads (krads) would be sufficient to prevent human toxoplasmosis and trichinosis from pork.

A study reported in the *Journal of Food Safety* concluded that a dose of 200 krads (a level not yet approved by FDA or USDA's Food Safety and Inspection Service) would "essentially eliminate" campylobacter in chicken. Irradiation at 250 krads could eliminate an estimated 93 per-

Tracing the Path of One Food-Borne Disease:
Transmission of Toxoplasma to Human Beings

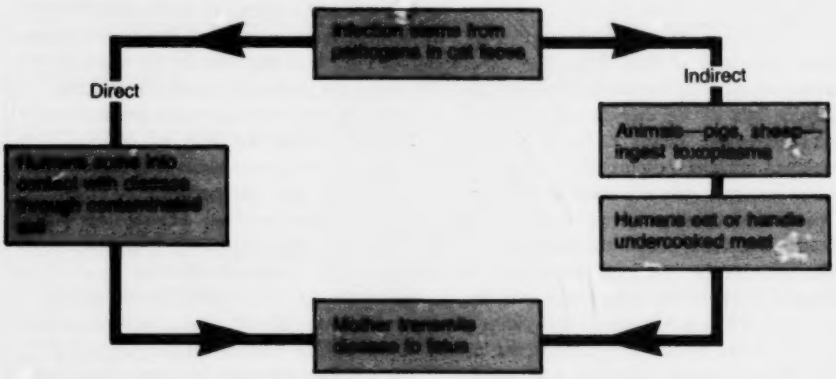


Table 3. Comparison of Annual Benefits Vs. Costs of Irradiation[1]

	Benefits	Costs	Ratio of benefits to costs	Net benefits
Pork[2]	$186-280 mil.	$ 80 mil.	2.3-3.5	$106-200 mil.
Chicken[3]	$341-653 mil.	$155 mil.	2.2-4.2	$186-498 mil.

[1]Based on Morrison and Roberts' 1985 study. Costs exclude transportation, promotion, and disposal of low-level radioactive waste. Also excluded are unforeseen adverse health effects of consuming irradiated foods. [2]Assuming 86 percent of U.S. pork is irradiated at 50 krads, which is sufficient to prevent human trichinosis and toxoplasmosis. [3]Assuming 81 percent of chicken is irradiated at 250 krads, which would eliminate campylobacteriosis and reduce salmonellosis cases by 93 percent.

cent of the salmonella-contaminated chicken carcasses. FDA is currently reviewing several toxicology studies on irradiated chicken to determine if they support the safety of irradiating chicken at 250 to 300 krads. If the data are sufficient, FSIS may petition FDA for approval of these higher irradiation doses.

Irradiation of beef at 250 krads to destroy salmonellae will also destroy beef tapeworm. In fact, as little as 40 krads will prevent tapeworms.

An ERS study *(see related article in this issue)* estimated the costs of using irradiation for medium and large chicken and hog plants which account for about 80 to 85 percent of total production. The study reveals that irradiation in the chicken plants to kill salmonellae and campylobacter would cost about 1.5 cents per pound, or about $155 million for the 10.3 billion pounds processed annually. The corresponding benefits of reducing disease from chicken produced at these plants totals $341 to $653 million.

Medium and large hog-slaughtering plants would incur costs of about 0.7 cents a pound, totaling $80 million annually for their 11.3 billion pounds of carcasses. The corresponding benefits of disease reduction from pork produced at these plants is $186 to $280 million. Both irradiation of chicken and pork appear to have favorable benefit-to-cost ratios of 2 or more *(table 3)*.

However, other options not evaluated here may have even higher net benefits. These include educating food preparers on methods to prevent cross-contamination and sterilizing feed ingredients to destroy pathogenic organisms. Further economic analysis is needed to determine whether irradiation, some other methods, or combinations are the most cost effective for reducing the risk of foodborne disease. □

Food Irradiation Policy Issues

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The Food and Drug Administration's (FDA) recent approval of irradiation to inhibit sprouting and maturing of fresh foods and to rid foods of insects introduces a number of public policy questions. Using radioactive materials on food raises questions about the possible impacts on workers and the environment, the role of the Government in consumer education, and implications for international trade.

The following questions highlight some of the public policy issues in the food irradiation debate. Answers to many of these questions will require additional research and information. It will be up to the food industry, consumers, and policymakers to decide if irradiation has a place among other postharvest techniques.

Do regulators have a test available to identify irradiated foods and confirm that the proper dose was applied?

One of the major problems with regulating food irradiation and assuring its proper use is that there is no commercially available method to determine if an item has been irradiated and at what dose. Foods treated with chemical preservatives can be tested to see whether too much or too little was added. The only discernible difference between irradiated and nonirradiated foods may be the reduction of bacteria on the irradiated product.

Recently, scientists in West Germany have had partial success in developing a method for identifying irradiated spices. Japanese scientists have conducted experiments using ultraviolet light to identify irradiated fish. USDA's Food Safety and Inspection Service has contracted with the National Bureau of Standards (NBS) to develop a post-irradiation testing method for determining whether pork and poultry have been irradiated. NBS scientists are conducting radiochemistry analyses to determine the effects of radiation on the food's chemical constituents.

In developing a test, one problem is that chemical changes induced by irradiation sometimes dissipate over time. Also, many of these chemical changes are the same as those caused by other treatments. Until a reliable post-irradiation testing method is developed, regulators will have to depend on the records of processors to assure that irradiation is used properly.

Should the U.S. Government take the initiative in informing consumers about food irradiation?

Consumer acceptance of irradiated foods and willingness to purchase them are critical to the commercial success of the process. Consumers who are unfamiliar with the technology may erroneously conclude that irradiated food is radioactive and could lead to radiation poisoning. Therefore, proponents of irradiation have stressed the need for international agencies and governments, as well as food industry representatives, to disseminate information on the technology.

Governments of several countries, including South Africa, the Netherlands, Israel, and Hungary, have conducted market tests of various irradiated foods. In South Africa, the tests were accompanied by an educational campaign. To coordinate the marketing of irradiated foods, the South African Government also established a National Steering Committee for Radurised Foods, composed of representatives from the Department of Agriculture and Fisheries, the Atomic Energy Board, the radiation and food industries, and the Consumer Council.

The role of the U.S. Government in consumer education has not been decided. A few articles discussing food irradiation have appeared in consumer-oriented Government publications, but there has been no widespread effort to provide educational materials for either food companies or consumers. Some observers argue that it is up to the food industry to inform consumers, citing the introduction of microwave ovens as an example of a new technology that was widely accepted without a Government information campaign. Others say that the food industry knows the most effective way to reach consumers. However, some feel that, on such a sensitive topic, consumers may be more receptive to information from the Government, and industry may welcome such Government efforts.

Would food irradiation add to the amount of radioactive material traveling our highways?

Currently, radioactive materials are shipped across the United States for use by hospitals, laboratories, and industry. Widespread use of gamma irradiation for foods would increase the transportation of radioisotopes somewhat. During a year's time, about 12.5 percent of cobalt-60 and 2.3 percent of cesium-137 radioisotopes decay and new radioactive material must be added to the original material to maintain the amount of product able to be treated. Irradiators using large amounts of cobalt-60 may replenish supplies every year or two, while those treating small quantities or administering lower doses are likely to purchase extra cobalt initially, rather than incur the transportation and loading costs each year.

Getting the radioisotopes from the reactors to the final user requires shipment across highways. Special shipping casks for radioactive material have been tested and approved by the U.S. Department of Transportation.

Would food irradiation increase demands on facilities for storing and disposing radioactive materials?

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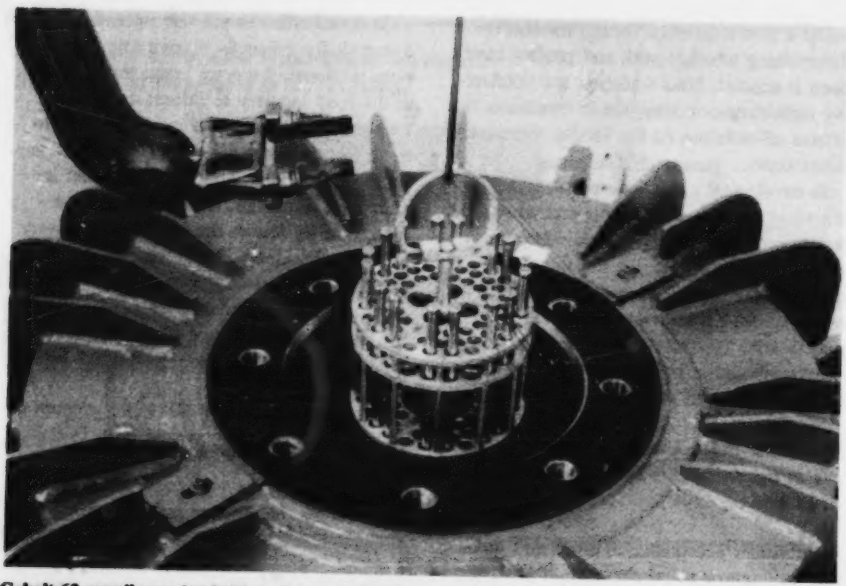

Cobalt-60 pencils are loaded into licensed shield containers for shipment to irradiators. Photo courtesy of Atomic Energy of Canada, Ltd., Ottawa, Canada.

The cobalt-60 most commonly used in an irradiator is contained in "pencils" about a half-inch in diameter and 18 inches long. After 15 or 20 years of decaying, the energy level of the original cobalt-60 pencils becomes too low to be useful for large operations. It is likely that irradiation operators will want to remove the old pencils to make room for new source material. The old pencils emitting low levels of radiation are not likely to add significantly to storage volume of such waste because, in many cases, the decayed sources can be reactivated or recycled for other industrial uses.

The small size of the pencils means that any cobalt-60 that is not able to be recycled would be a minute portion of the approximately 2.68 million cubic feet of low-level radioactive waste disposed of in 1984. Also, older cobalt-60 from radiation therapy uses, which require intense doses, can be recycled to the lower level uses needed by a food irradiator. Therefore, it is possible that low-level radioactive waste disposal of cobalt-60 could decline with use in food irradiation.

Like cobalt, the cesium-137 capsules used as a radiation source are relatively small, and net addition to low-level radioactive waste is not an issue. The slower decay rate of cesium-137 means a longer period between reloadings compared with cobalt. However, the cesium-137 in the capsule is in a water-soluble form, which means a leaking or ruptured capsule could contaminate any water around it. Thus, special precautions must be taken when using, transporting, and storing cesium. Cobalt-60 is not water soluble.

Critics of food irradiation question the adequacy of Department of Transportation and Nuclear Regulatory Commission (NRC) regulations covering the transportation and use of radioisotopes. They point to accidents in which radioactive materials have been lost or disposed of improperly. These opponents contend that the environmental impacts and dangers from leaking sources or unauthorized disposal of spent radiation sources have not been sufficiently addressed.

Facilities using machine-produced ionizing radiation, as opposed to radioisotopes like cobalt-60 and cesium-137, would not add to the amount of radioactive materials being shipped across highways or to the disposal of low-level radioactive waste. In these facilities, radiation is produced by a machine powered by electricity.

Would workers in commercial food irradiators be at high risk?

Facilities using radioisotopes must satisfy the safety requirements of the NRC or a set of similar requirements enforced by 27 States. Users of machine-produced ionizing radiation must satisfy State regulations. The NRC and State regulations, covering irradiator design and operating procedures, are designed to protect both workers in the facility and the general public.

Radioisotopes have been used for commercial irradiation for about 20 years. Richard Cunningham, Director of NRC's Division of Fuel Cycle and Material Safety, reported that there were 35 commercial gamma irradiators licensed by the NRC or the 27 self-regulating States in 1984. Because two major radiation exposures occurred when workers failed to follow the proper operating procedures, NRC's regulations were amended to require automatic systems to ensure that a worker cannot enter the cell when the source is unshielded. Similar requirements exist for machine-produced radiation to prevent workers from walking into the cell when the machine is on.

Will irradiation enhance food exports or imports?

A technology that increases shelf life extends the geographic market for fresh products. A longer shelf life provides extra time to reach distant markets or the use of a

slower, and thus cheaper, mode of transportation. Irradiation may allow longer distance shipping of U.S. commodities abroad, assuming the recipient country will accept irradiated food. At the same time, FDA's approval of food irradiation may allow other countries to expand their exports to the United States. Researchers at the National Marine Fisheries Service point out that FDA approval of fish irradiation may allow Canada, Iceland, and Norway to increase the amount of fresh fish fillets they ship to the United States.

Another way irradiation could expand international trade is by disinfesting products prohibited from being imported because of quarantine restrictions. The importing country must also accept irradiated products, however.

Will irradiation affect the economic structure of the U.S. food sector?

The introduction of a new technology can lead to significant changes in the number and size of firms within the affected industry, particularly if that technology significantly reduces unit costs of production, creates a new product, or adds special appeal to an existing one. Firms that are quick to adopt such a technology enjoy an edge in profitability for existing products, or they may gain an opportunity to establish new markets or capture a larger market share.

For More Information...

Other policy issues raised by food irradiation are discussed in a report by the authors entitled *Food Irradiation: New Perspectives on a Controversial Technology: A Review of Technical, Public Health, and Economic Considerations*. The 160-page report contains the assumptions and methodologies behind the estimates of irradiation costs and public health benefits, as well as a further discussion of technical considerations, consumer acceptance, and international activities.

For information about obtaining the report, contact the authors at USDA-ERS, 1301 New York Avenue, N.W., Rm. 932, Washington, D.C. 20005-4788 or phone (202) 786-1787.

To the extent that irradiation might replace existing technologies to preserve food, it could affect the structure of some industries. Based on the ERS analysis of treatment costs *(see first article in this issue)*, it does not appear that irradiation will dramatically alter food preservation practices. However, changes in consumer preferences or in food safety regulations could change that conclusion. For example, if new regulatory measures prohibited use of important chemical preservatives or fumigants, the competitive stance of irradiation would increase.

Food irradiation could also provide a competitive edge to adopting firms if consumers not only accept the technology, but come to prefer it over other methods of food preservation. Irradiated foods may gain appeal on the grounds of health and safety, perhaps by reducing the risk of salmonella poisoning or by substituting for chemical preservatives.

The ERS analysis of average treatment costs as plant size or capacity increases (economies of scale), combined with information about current industry structure, provides some insight into the potential effects of irradiation on future industry structure. Average costs per unit of output were found to decrease as the size of the irradiator and the amount of product being treated increased. However, this relationship becomes less dramatic at annual capacities greater than 50 million pounds. Thus, an industry composed of fairly large firms would not have to fear that economies of scale for food irradiators would trigger rapid consolidation.

Other industries may be less concentrated, and individual plants may handle smaller capacities. For irradiators treating less than 50 million pounds a year, size has a greater effect on average treatment costs. However, individual growers often join together in cooperatives, which may have sufficient volume to justify an irradiator. Another option is to locate a contract irradiator at a port or in the center of a growing area, where it could treat appropriate agricultural products on a fee basis. □

Food Contamination: Consumer Reactions and Producer Losses

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Chemical contamination of food products has received a great deal of attention lately. Ethylene dibromide (EDB), polychlorinated biphenyls (PCBs), and heptachlor are strange chemical names that have become all too familiar in the last several years.

These and other contaminants have meant losses for producers as they incur costs for laboratory testing, veterinarian and legal fees, extra costs to hold contaminated animals that cannot be marketed, and in some cases, animal mortality costs.

Producers also face losses associated with consumer uncertainty about what foods to buy. Following a contamination, consumers may avoid foods even when they are safe. The authors' 1984 Michigan State University study assessed the losses associated with public confusion over product safety and lower sales of uncontaminated products in a 1982 contamination incident in Hawaii. The study concluded that losses due to consumer uncertainty may be minimized with proper government and industry response.

Contamination: A History of Losses

Documented incidences of chemical contamination in the U.S. food supply go back to the "Great Cranberry Scare of 1959." The Department of Health, Education, and Welfare announced shortly before Thanksgiving that year that cranberries might have contained residues of a herbicide, amino triazole, thought to be a potential carcinogen. A 1969 study found that sales of cranberries in Atlanta markets fell 26 percent in 1959, but revived the following 2 years.

In 1968, [illegible] percent of Montana's milk supply contaminated with the pesticide chlordane, which had been sprayed on alfalfa fed to dairy cattle. In Congressional hearings after that incident, a dairy producer noted that the publicity associated with the incident caused a large drop in sales and that it took months for markets in that State to return to normal.

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More recent incidents provide some indication of the losses associated with food contamination. The largest known incident of chemical contamination of food occurred in Michigan in 1973. Livestock feed sold in Michigan was accidently mixed with polybrominated biphenyls (PBBs), a toxic chemical used in fire retardants. As a consequence, milk, beef, pork, lamb, and eggs were contaminated. The Congressional Office of Technology Assessment estimated in 1979 that the cost of food destroyed in this case approached $215 million. According to press reports, sales of safe food were also affected, although the exact extent is unknown. The PBB incident also caused Canada to temporarily close its border to Michigan meat products. The State spent more than $250,000 in a campaign to restore consumer confidence in Michigan agricultural products.

In 1979, another large-scale incident occurred, this time involving polychlorinated biphenyls (PCBs), widely used as a coolant. At a meat packing plant in Montana, PCBs leaked from a damaged electrical transformer into products used in animal feed and human food. Ultimately, the incident affected 18 States and two foreign countries at an estimated cost of $11 million to producers and State and Federal agencies.

The cost of laboratory testing is one financial loss caused by food contamination.

In 1982, the pesticide heptachlor contaminated more than 80 percent of the milk supply on Oahu, Hawaii's most populated island. Over $8.5 million worth of milk was condemned by public health officials. Milk sales were substantially below expected levels for more than a year. The authors estimated that poor sales of safe milk cost dairy producers an additional $600,000—about $39,000 per producer on Oahu over a 16-month period. Furthermore, an Hawaiian consumer group lodged suits totaling $500 million against island milk processors. The suits remain unresolved.

Also because of this incident dairy producers in Hawaii lost their exclusive control of the State's milk market. Ever since 1984, mainland milk has competed with local milk on Oahu.

Other more recent incidents include EDB residues in grain products 2 years ago, pesticide contamination of California watermelons in 1985, and heptachlor in milk and milk products in Arkansas, Missouri, Kansas, and Tennessee earlier this year. Although there are as yet no published studies of consumer reactions to these incidents, newspaper accounts indicate that all three resulted in reduced sales.

Explaining Consumer Reactions

As consumers become aware of contamination, they are often unable to differentiate between those products that come from contaminated operations and those that do not. Consumers may be suspicious of all related products, and thus forgo consumption of even those that are safe. This loss to consumers is also a cost to producers.

The less differentiation, the greater the likelihood that that lost sales will affect producers of similar, but uncontaminated products. This may be particularly true of raw or slightly processed food products, such as red meat, milk, eggs, and vegetables.

The closing of oyster beds because of kepone contamination in Virginia's James River provides an example. A 1981 study

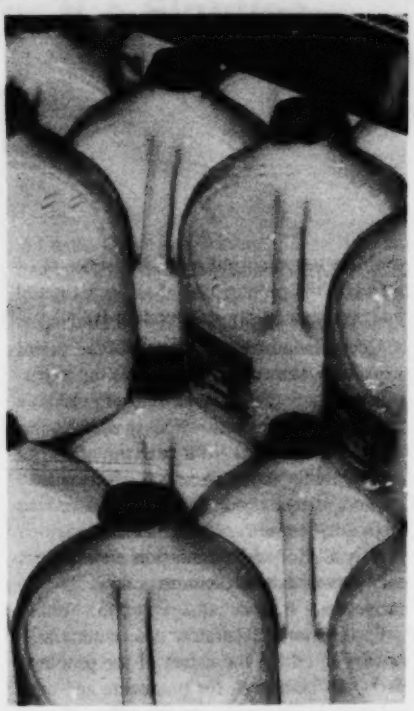
of oyster sales in Baltimore revealed that oyster demand in that area fell in response to the announcement, despite the fact that only uncontaminated oysters were sold in Baltimore. The study indicated that news coverage was an important factor in explaining the change in consumer behavior and that unnecessary losses to consumers and producers could have been avoided if the public had been properly informed of safe and unsafe sources.

The heptachlor incident in Hawaii provides another example. The majority of the milk on Oahu was contaminated. However, uncontaminated milk was brought from other islands to offset the reduced supplies. Local milk remaining on the shelves was also officially declared safe. Nonetheless, sales were significantly below what would have been expected.

The Michigan State University study of the incident indicated that media coverage of the health hazards of the contamination, and hence public awareness of the hazard, was associated with depressed milk sales. Furthermore, reports that milk was safe appeared to have a negative effect on sales. Any media attention—good or bad—the study suggests, may have simply maintained consumer awareness of the contamination incident, further depressing sales.

The study results underscore the importance of source credibility in dealing with a contamination incident. In Hawaii, government officials issued recalls of specific products as they were found to be contaminated, declaring that unrecalled products were safe. Six official recalls over a 5-week period were issued, leading some in the media to question whether government officials were more interested in producer than consumer welfare.

Consumers of different ages, sex, or race reacted differently to the incident. A random sample survey conducted by one of the Hawaiian dairy processors 3 weeks after the first recall but before the last two recalls revealed that 99.5 percent of those sampled were aware of the contamination. Across age groups, younger consumers reported that they reduced their milk consumption more than other groups. Females were also more likely to report reduced milk consumption. Caucasian consumers reported a larger decline in milk purchases than did Orientals. Furthermore, households with children altered their purchase patterns much more than those without children.



Although milk remaining on store shelves in Hawaii was proven safe after the heptachlor incident, sales were below what would have been expected.

A 1983 study similarly examined the demographics of consumer reactions to the 1977 announcement of the potential carcinogenicity of saccharin. The results further illustrate differences in consumer responses to news of a potentially harmful element in the food supply. The study showed that college-educated consumers were among the first to reduce their consumption of soft drinks containing saccharin, followed by households with young children. The elderly and consumers without a high school education did not reduce their intake, despite public health warnings and media attention. This suggests that different types of products—which appeal to different segments of the population—should be treated differently in educating consumers about their safety.

Aftereffects Can Be Far Reaching

Although lost sales may be evident immediately following a contamination incident, the effects may also be long term. When consumers reduce their purchases of a particular product they may turn to substitutes. This change could become a permanent part of purchasing habits and consumption patterns, depending on the product and the type of substitutes available.

Losses will be higher and long-term implications greater in markets with many substitutes. Oahu customers who grew tired of fruit nectar or powdered milk had few alternatives but to buy island milk. (Mainland milk was not allowed for public sale until months after the recall.) Estimated losses of milk sales in Oahu, therefore, were low compared with incidents in which contaminated products had many substitutes. An example of this: After a man died of botulism poisoning from Bon Vivant vichyssoise in 1971, the company soon filed for bankruptcy.

Competitors may attempt to capitalize on a contamination incident by entering the market and permanently changing purchasing behavior. Prior to the heptachlor incident, for example, milk sold in Hawaii was produced locally. After the incident, Safeway stores in Hawaii were allowed to import mainland milk, changing the structure of the Hawaiian milk market.

Public and Company Policy Can Help Cut Needless Costs

Once a contamination incident is known, losses to the industry are certain to occur. While there is probably little that can be done to reduce such losses due to product recalls, liability suits, and testing costs, other types of losses may be avoided. For instance, sales losses because consumers are uncertain of food safety may be avoided.

Producers' ability to regain their standing in the market after a contamination incident may be greatly affected by the producers' response to the contamination. The 1982 Tylenol case provides a good example of how proper producer response can minimize lost sales in the long term. After seven people died from the first case of Tylenol capsules laced with cyanide, Johnson and Johnson's share of the pain reliever market plummeted from 35.4 percent to 7 percent. Polls indicated that about half of Tylenol users thought they would be unlikely to use

Johnson and Johnson's product again, and sales were down 80 percent.

The company's response was to remove a potential threat to public health and recall its product at a cost of $100 million. They invested heavily to become a leader in new tamper-resistant packaging in order to relieve consumer fears about the safety of their product. As a result, Tylenol once again became the Nation's leading nonprescription pain reliever. (After the newest Tylenol contamination, the company also acted quickly to minimize the public health threat.)

According to press reports, Johnson and Johnson was partly successful in restoring public confidence in Tylenol in 1982 because company officials had just completed an 18-month review of their company code of ethics before the incident occurred. Consequently, at least some consensus existed within the company on the appropriate approach to the problem. This example suggests the importance of developing consensus-building policies before a crisis occurs.

In industry-wide contamination incidents, like the one in Hawaii, there is no parent company to act quickly to reassure the public. That role falls to government, industry leaders, and trade associations. Therefore, ethics codes and policies for dealing with contamination are also vital at these levels.

The Hawaiian incident illustrates that the long-term interests of the industry may best be served by protecting the short-term interests of consumers. Government and industry can minimize sales losses by quickly removing the perceived health risk. By minimizing consumer exposure to suspected products, consumer uncertainty over product safety may be reduced. Disputing unfavorable test results through advertising when it is already known that a contamination problem has occurred may only serve to maintain the prominence of an incident and increase uncertainty surrounding it.

Government contingency plans for quickly expanding laboratory capacity in the event of a contamination would be useful in preventing undue loss. Quickly discovering the cause and scope of a contamination problem may require analysis of many product samples, outstripping normal laboratory capacity. Delays in discovery may result in public confusion and unnecessary losses to both consumers and producers.

Furthermore, accurately determining and openly admitting the extent of the problem early can bode well for producers and consumers. A 1981 study on the effect of product recalls found that releasing the worst possible information first, followed by less alarming releases, resulted in more favorable consumer perceptions of a company than when information on possible health risks grew increasingly worse.

Government and industry officials should alert the public to potential hazards. Hence, the public will not be surprised should those hazards be confirmed. Should the hazards not be realized, the study indicates that consumer perceptions of the industry will be enhanced.

When officials have to retract their statements or are proven wrong, they lose credibility with the public and their ability to help restore consumer confidence is weakened. The Hawaiian milk contamination and Tylenol incidents are prime examples. One year after their respective contamination incidents, the Hawaiian milk producers were threatened with complete loss of their market, while Tylenol had regained its dominant market position.

The producer who takes actions to maintain consumer confidence is not totally shielded from the adverse effects of a contamination incident. Despite efforts by some producers to maintain product quality, they may still bear the costs created by another producer who markets a contaminated product. Unless a method is found to impose the cost of marketing a contaminated product on those responsible, market forces alone will not ensure consumers of a safe food supply or producers of consumer confidence in their products. For the industry, this means working together with government to ensure the safety of the food supply. □

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Food Safety Issues for the Eighties

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Food safety can be a controversial issue. The authors present one perspective on this complex topic.

Concerns about antibiotics in meat, pesticide and herbicide residues in food, and chemical additives used in processing have brought the U.S. food safety system under scrutiny. Consumers, farmers, food processors, food technology innovators, and regulators alike have raised questions about the directions the U.S. food sector should be heading in the latter half of the 1980's.

Assessing Consumers' Concerns

Consumers, the largest group of participants in the food market, are particularly concerned about food safety. Today's consumers are better educated and more aware of the diverse health issues associated with the way foods are produced, processed, marketed, and prepared.

The types of foods we eat have also changed in response to growing concerns about diet and health and changing lifestyles. Smaller households, working mothers and singles, and more money to spend on food, for example, have increased the demand for more convenience foods. These foods, however, may be the source of additional health risks from the chemical additives needed to enhance preservation and increase appeal, and possibly from contaminants added unintentionally.

Over the years, surveys about food safety have revealed that consumers want more protection from and more information on food safety hazards. These concerns, in turn, raise questions about who should provide food safety protection and information and who should pay the additional costs.

A 1984 national survey of 1,008 American consumers by the Food Marketing Institute (FMI) indicates that many of them fear that some of the chemicals used in producing, processing, and preserving foods are not safe. Of all respondents, 77 percent said that pesticide and herbicide residues in food are a serious health hazard. Thirty-two percent mentioned food additives and preservatives and 26 percent named coloring agents.

What's more, they claimed that they avoid buying products they believe to be risky. Chemical flavorings were identified as substances that were avoided by 25 percent of respondents; preservatives by 17 percent; sugar by 22 percent; and salt by 17 percent. Microorganisms known to spoil foods were indicated as a concern by 12 percent of the respondents and harmful disease-causing agents, such as salmonella, by 6 percent.

The FMI survey results also suggest that some consumers want foods offering more protection from possible hazards. This may range from wanting more stringent sanitation standards and increased use of tamper-resistant packaging to reduced use of chemicals. In fact, concerns about chemicals have meant a growing market for "natural" foods—those produced without pesticides, animal drugs, or chemical fertilizers, as well as foods processed without preservatives or other additives. Other markets exist for new formulations of foods with reduced amounts of specific additives, such as sugar, salt, or other ingredients suspected of contributing to certain diseases. On the

Today's consumers are more aware of the diverse health issues associated with the way foods are produced, processed, marketed, and prepared.

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other hand, some consumers appear to want foods enriched with nutrients that are beneficial, including calcium, iron, and certain vitamins.

While these consumers seem to want increased food protection services, others may choose to sacrifice some of these services for lower prices. For example, the recent return of bulk-product merchandising caters to those willing to forgo the protections and some of the label information provided by individual product packaging.

Wanting More Information

Directly related to the concern about more protection services is a desire for more food safety information. The 1984 FMI survey showed a sharp increase in consumer self-reliance to determine the safety of food. However, consumers need reliable information about the risks involved and their potential severity to make valid food safety judgments. Reliable information may be difficult to obtain for a number of reasons, including insufficient data for determining risk, the prevalence of conflicting or unfounded claims in the popular press, and the problems of translating complex laboratory data into practical guidelines for consumers.

Surveys suggest that consumers want two major types of food safety information. One type is purely descriptive information about the product itself, such as ingredients, nutrient composition, chemical substances used to produce the raw commodities used to make the product, processing technology, and type of packaging material. Some of this information is required by law to be declared on food labels.

The second type of information requested is a professional safety judgment, such as a warning statement on the label that consumption of the item may cause some illness or disease. Currently, soft drinks with saccharin must carry warning labels indicating the link between the sweetener and cancer in laboratory animals. Consumers are confronted with an unquantified probability of this hazard and left to choose whether to purchase the product, depending on their perception of the risk involved. It is important to realize, however, that this selective use of warning labels relies upon a regulatory process of some type to identify and quantify important hazards and make professional judgments about them.

Food Industry Views

Enactment of food safety laws and their enforcement by regulatory agencies have removed much of the opportunity, risk, and uncertainty that firms would have in the marketplace if they were left on their own to develop acceptable safety standards and compliance procedures by which to compete with one another. Food safety regulations establish a floor below which food safety performance cannot fall.

Some government safety standards, such as good manufacturing practices and the use of approved equipment or packaging materials, specify the processes used to produce a food product (process standards). Other government safety standards specify the purity or composition of the final product (product standards). These include product standards of identity and composition as well as tolerance levels for pesticide and animal drug residues and environmental contaminants.

Beyond this minimum level of safety, however, the food industry seems to have been reluctant to respond to demands for more food safety services for several reasons. First, there is little incentive for a firm to adopt safety services that increase costs, except to differentiate a product and obtain either higher prices or greater sales than the competition. In many cases, competitors cannot be prohibited from emulating safety services or information, so there is little opportunity for the initiating firm to recover development costs. Shelf-life or freshness dates printed on packages provide just one example. Competitors can easily copy this information with no fear of reprisal and at no cost for the experimentation leading to the information.

Secondly, no comprehensive market research results available from the public or private sectors indicate the extent of the market for many of the new food safety services proposed by consumers. Firms will have to engage in expensive and time-consuming experimentation to determine the demand for new services and how much consumers would be willing to pay for them.

Firms are concerned about the safety of products purchased as ingredients for processed foods. Potential hazards, such as chemical residues and microbial pathogens, are often neither visible nor readily detectable and are sold to unsuspecting buyers. Ownership identity is frequently lost during marketing, as commodities and ingredients are assembled or blended into new lots for resale. In the event of a loss, such as a product recall, the party actually responsible may remain undetermined and may never pay any more than a small fraction of the loss.

Lack of assurance about the safety of purchased commodities used as ingredients encourages food firms to vertically coordinate production and marketing. Then a firm can impose safety performance and process standards, as well as monitor for compliance at each step in the process. Furthermore, larger firms can capture any economies that might result from applying new, more efficient hazard-detection techniques to large-volume operations. High investment and operating costs might prevent smaller firms from owning and leasing such systems. This leaves them exposed to potential economic losses from the use and sale of less safe inputs and products.

Regulation and Innovation

While the safety of chemicals in the food supply is often in question, pesticides, food additives, animal drugs, and packaging materials have been some of the most important cost-reducing innovations of the last several decades. They have expanded the number and types of foods available to the consumer and helped assure a bountiful food supply. Also important or promising for the future are: vacuum packing, ultra-high temperature processing, mechanical deboning, irradiation, microwave cookery, genetically engineered drugs, food additives, and animal growth stimulants, to name only a few of the new processes.

The innovators of many of these substances and processes, chemical and pharmaceutical firms, are concerned that too many costly licensing and registration approval procedures discourage the rapid development of new methods or products. In the past, these innovations have helped the United States maintain its present technological lead in food production and marketing. This is a lead being challenged by Japan and European countries that are pursuing advancements in biotechnology and encouraging high-tech firms to relocate in their countries.

Most food innovators feel that animal drug, food additive, and pesticide registration procedures are unnecessarily complex and time-consuming for both industry and for regulators. Insufficient technical information to assure safety may be provided by the firm, or the regulator may be uncertain about what information to request. Sometimes the scientific issues are so complex that professional differences in the opinions of petitioner and reviewer require additional technical information or withdrawal of the petition altogether. The lack of specific procedures to follow for testing and analyzing substances for safety is a frequent source of difficulty. Yet there is no single set of procedures that apply, or possibly should apply, to safety testing for all pesticides, animal drugs, additives, or other substances, such as packaging materials.

The increasing complexity of the registration procedure is evidenced by the drop in the rates of approval for new substances during the past decade: from 4.2 new animal drugs per year during 1967-71 to an average of 1 per year during 1976-79. The time required for the approval of a food additive can take up to 10 years. The time for pesticide approval can range up to 6 years.

Even though the Reagan Administration took steps to cut time requirements by introducing "fast-track" approval procedures, innovating firms had already started to relocate research and development operations overseas. A U.S. pharmaceutical manufacturers' survey showed that 20 percent of the research was done abroad in 1979, compared with 10 percent a decade before. Other companies are getting out of the research area altogether because of the unfavorable outlook.

Furthermore, food industries in many foreign countries can obtain nationally approved substances far in advance of their approval by U.S. regulatory agencies. For example, between 1970 and 1980, the European Community (EC) approved 24 new animal drugs that were not available in the United States during the same period. Moreover, EC approval times for some substances are only half those in the United States.

Molecular biologists are expected to produce many new substances for expanding food output and lowering production costs during the next decade. Continued faster approval of the use of such substances by foreign countries could seriously erode the United States' ability to produce efficiently at home and to compete effectively in international markets. The bottom line could be a smaller share of world markets for U.S. food products.

Reconfirmation Poses Another Problem

A further complication is the reconfirmation of previously approved substances. Many food innovators believe too much time and money must be spent on defensive research to reconfirm the safety of previously approved substances. Scarce research and development funds must be redirected away from developing new products.

Rapid advancements in bioassay procedures to test for safety fuel the reconfirmation problem. It is now possible to detect the presence of some contaminants at concentrations of parts per billion or trillion. Many substances still in use were approved years ago by far less sophisticated assay techniques. In 1979, the Food and Drug Administration (FDA) proposed procedures to test all new and old animal drugs for carcinogenicity. However, the proposal was judged excessively costly. The carcinogenicity tests for some old drugs might exceed their total annual revenue by one or more times, probably forcing their withdrawal from the market. Producers relying on the use of these compounds might need to make cost-increasing production adjustments to compensate for the loss of withdrawn substances. Furthermore, committing scarce research funds to keep products without any evident adverse effects on the market might slow the development of new products.

Recently, the FDA offered a revised proposal that substantially modifies the earlier one. This new proposal, known as the "Human Food Safety Proposal," omits any mention of testing old drugs for carcinogenicity but does revise requirements for testing new drugs. This new version might extend the market life of some old compounds not currently suspected of being cancer-causing.

The capability to detect minute concentrations of potentially hazardous substances in food has stimulated interest in amending the anti-cancer Delaney clause of the Food, Drug, and Cosmetic Act. When it was enacted in 1958, the zero tolerance feature of the Delaney clause was defensible because the best assay method lacked the sophistication to detect small amounts of cancer-causing substances. But advancements that enable laboratory technicians to detect minute, and what many consider harmless, quantities of these substances support the adoption of a non-zero tolerance. Such a tolerance would enable the approval of foods and additives currently prohibited by the Delaney clause. The policy problem is trying to determine a socially acceptable and scientifically supportable level of risk.

Another area of concern in the food industry is that the patent protection term of 17 years is too short to provide firms the necessary incentives to invest in the costly development and approval of many needed substances. Controversy over the inadequate length of the patent protection term originates with the protracted delays experienced by petitioners who try to obtain registration approval for pesticides, animal drugs, and food additives from regulatory agencies. Innovators sometimes obtain a patent only to find that they may not be granted a registration petition to sell the product

for several years. The innovator is not granted any adjustment for obtaining registration approval. Recovery of a usually substantial investment must be made in whatever time is left on the patent. The Congress recently enacted legislation to extend patent terms for certain additives and pharmaceuticals but did not to enact companion legislation for animal drugs and chemicals.

Extending the patent protection term for substances that might need to be reviewed periodically with up-to-date procedures to verify their safety could provide the private sector with one incentive to test a product instead of withdrawing it from the market. A guarantee of an extended protection term would improve a firm's ability to recover its testing costs without fear of early competition from price-cutting competitors. Once the patent expires, these competitors can replicate the product without bearing any of the research and development costs.

Policy Considerations

Achieving the goal of increased food safety to satisfy domestic and international market needs will require both public and private sector involvement. Government may need to be active in sponsoring basic research and developing applied techniques in situations where an uncoordinated private sector approach would lead to duplicated efforts, excessive costs, and a high probability of failure in successfully completing the research. Public policies to fulfill informational and educational needs are appropriate for the same reasons.

Given the rapid changes in technology, new definitions of safety and new standards and enforcement strategies may need to be developed, debated, and adopted by public policymakers. Protection of producer well-being and the need for extended patent protection also may need to be resolved by public policymakers because of the numerous legal issues involved. In addition, diplomatic protocal will probably continue to require extensive public involvement in negotiating and approving international definitions of safety and compliance standards for food and commodities sold in international markets.

Policymakers and regulatory agencies are concerned about determining the optimum level of enforcement. Too little can result in numerous violations and huge losses to society. But too much enforcement can lead to expensive protection with only marginal returns in terms of safety. Unfortunately, virtually no empirical evidence about the losses associated with different levels of enforcement expenditure is available. It is neither technically nor economically possible to eliminate all forms of food safety risk. Society needs to establish some reasonable goals and let the regulatory agencies develop cost-effective measures that would bring per dollar costs and benefits in line.

What about consumers? What does the evolving food system mean for their convenience, nourishment, and satisfaction? It is likely that the U.S. food supply, already one of the safest and most abundant in the world, will become more so. However, consumers may have more food safety choices as new products differ in degrees of safeness. This will mean consumers will have to make more decisions about safety and food costs.

It is also likely that the amount of safety-related information available to consumers will continue to grow. To be valuable to consumers, this information must be factual and free of the sensationalism that often characterizes stories on food safety problems. Consumers of all ages will require intensive education on hazards, their consequences, and how to prevent them. Many of the most common and serious food safety hazards are found in the home. Finally, consumers need to understand that the food safety system acts best when it spends its limited resources on the most serious health hazard problems. It is not possible, either technically or economically, to eliminate all risks to human health from the food system.

As for industry, much of the market development and application of compliance methods will remain with the private sector. The private sector will continue to have a leading role in determining the structural arrangements by which producers and the food industry will coordinate production and food safety protection. And within the constraints imposed by public regulation, the private sector will test market potential for additional services. Such services will determine future courses of action for both public and private involvement in establishing new policies and programs. □

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Food Safety: Consumers Report Their Concerns

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Consumer concerns about food safety and the role of the Government in providing a safe food supply date back at least to the early 1900's, when Upton Sinclair graphically described the unsanitary and unwholesome conditions of the meatpacking industry in his book *The Jungle*. The book resulted in consumer pressures which led to the passage of the Meat Inspection Act of 1906.

In line with this long-standing issue, determining the food safety concerns of consumers in the 1980's was the goal of a 1983 Kansas State University survey. Researchers polled a representative sample of consumers in eight Kansas counties *(see sidebar box)*. The questions focused on food safety in general and meats in particular. Among the questions consumers were asked:

- Which food safety hazards were of most concern to them?
- Which foods were most likely to harbor a hazard?
- At which point in the food production and marketing chain were hazards most likely to occur?
- Was the use of chemicals beneficial or harmful to the food supply?
- How active a role should Government play in food safety?
- How much were they willing to pay for increased food safety information?
- From whom did they receive their current food safety information?

When the survey results were compiled, researchers found, as might have been expected, that consumers were likely to underestimate how easily they could mishandle food prepared at home; that consumers differed from experts in their perceptions of the major sources of foodborne risk of illness; and that women were more concerned about food safety than men were.

However, there were some surprising results. For example, affluent consumers and the mothers of young children weren't the most concerned about food safety. Rather, the elderly and those of more moderate income were. The elderly were particularly concerned about food additives and hormone and animal drug residues.

Assessing the Concerns

Respondents were asked to rank a list of food safety hazards according to their perceived severity. Consumers ranked environmental contaminants, such as PCB's, dioxin, and mercury, first, followed by disease-causing organisms, such as salmonella and trichina; pesticides; animal drug or hormone residues; and finally, food additives. (In contrast, most experts in food safety put microbiological contaminants at the top of the list of foodborne hazards, followed by environmental contaminants.)

The relatively low ranking of food additives contrasts with previous studies. Consumers appear to have been concerned about food additives in the 1970's. Possibly, the educational efforts of universities, the food industry, cooperative extension, and Government have diminished consumer worries. Furthermore, environmental contamination is now a visible and newsworthy topic. The contamination of Times Beach, Missouri, by dioxin was much in the news before the survey was conducted. Similarly, there had been a controversy the preceding year in Kansas over illegal use of diethylstilbestrol (DES), a synthetic hormone once permitted as a growth stimulant in livestock production but banned in 1979.

With foodborne illnesses generally associated with perishable protein foods, it is not surprising that red meats, poultry, and dairy products (in that order) were cited as the food groups of greatest concern. In terms of contamination by animal drugs or hormones, the survey respondents ranked beef first, followed by pork, poultry, milk and cheese, and finally, lamb.

When asked where in the food chain contamination of livestock and meat products occurred, those responding to the survey cited processing plants as the most likely site. This response seems to indicate consumers' lack of knowledge of, or confidence in, Federal or equivalent State inspection in meat processing plants.

Livestock feedlots were cited as the second most likely problem site, followed by feed manufacturing plants. If they mix medicated feed, the feed mills are inspected on an intermittent basis by the Food and Drug Administration. The farm was the eighth most likely site of contamination, suggesting that consumers may perceive the farm as a "family" operation, and therefore safer, while the feedlot is regarded as a business or industry. The home ranked last as a site of potential food contamination.

This confidence in the home is consistent with previous consumer surveys, but not necessarily reality. Time and temperature abuses of foods are likely to occur in the home and often lead to safety problems. In fact, responses to other questions in the survey revealed that a significant percentage of consumers unknowingly followed unsafe food handling, preparation, and storage practices. For example, 32 percent responded that they let cooked chicken cool to room temperature before placing it in the refrigerator—a practice that food scientists strongly discourage.

The misperception of the relative importance of the home is consistent, however, with psychologists' assessments of consumer risk perceptions in general. Consumers generally indicate greater concern about hazards they are unable to control, whose effects may occur far in the future, and which can lead to serious injury or death. Unknowingly ingesting environmental contaminants may seem more repugnant because of the uncertain promise of long-term consequences than gastrointestinal symptoms due to improper refrigeration of the evening meatloaf.

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Consumers saw the farm as one of the least likely sites for food contamination.

Use of Chemicals in Food Production: A Benefit or Bane?

To determine consumer views of the role of chemicals in the food supply, respondents were asked to assess the impact of pesticides, drugs and hormones, and feed additives on food prices, costs of production, availability, quality, and safety. In terms of prices, more than 50 percent felt that in general they were higher as a result of pesticide use. This is contrary to the views of most economists. In a similar misunderstanding, more than half of the respondents also felt that the use of hormones pushed up meat prices. On the other hand, about 24 percent thought meat was less expensive as a result of hormone use.

Nearly 60 percent believed pesticide use increased the cost of food production, with an additional 10 percent indicating the rise was sizable. Nearly 60 percent believed animal drugs increased the cost of meat production, while 25 percent perceived that the drugs would lower production costs.

About 65 percent believed food availability is greater because of pesticides. A smaller share, 57 percent, agreed that meat supplies would increase with drug and hormone use, with an additional 12 percent believing a large increase would occur. Only 3 percent said that food supplies would decrease with pesticides or animal drugs and hormones, and less than 15 percent indicated there was no impact. The results of the food availability question seem to indicate that most consumers understand the role of chemicals in extending food output.

In addressing food quality, about 21 percent of the respondents indicated that animal drugs and hormones enhanced taste and appearance, while 34 percent felt pesticides did. Over 20 percent, however, indicated that they didn't know how these chemicals affect food quality.

How consumers feel about the safety of food products after pesticide and drug and hormone use is a key part of the residue avoidance issue. Survey responses help producers understand consumer concerns. Roughly 42 percent of the respondents believed that overall food safety is decreased with pesticide and drug and hormone use. About 31 percent thought the food supply was safer as a result of pesticide use and 21 percent saw drugs and hormones as beneficial. These consumers may assume that a healthier animal means safer meat. Over 20 percent of the respondents indicated they did not know how drugs and hormones affected food safety.

Should Government Make Food Safety a Top Priority?

In addition to collecting information regarding food safety problems, researchers polled consumers on one source of solutions: the Government's role in assuring food safety and providing information and services. About 90 percent of the respondents agreed that keeping food safe should be a high Government priority. When asked if the Government should try to eliminate all health risk from the food supply, 63 percent responded positively; 27 percent disagreed. Over 70 percent of those polled felt that the Government should not permit any cancer-causing chemicals in the food supply, while only 14 percent disagreed.

When asked whether the Government should require health risk information on food labels, the result was an overwhelmingly supportive majority of 80 percent. Over 65 percent of the respondents wanted the labels to indicate if meat products were free of animal drugs, hormones, additives, and other chemicals. Almost 45 percent felt labels should contain nutritional information, and 30 to 35 percent want to see the cholesterol content on labels, as well as details on how to cook, handle, and freeze meats. Rankings of the type of information of interest varied by age *(table 1)*. The

Table 1. What Information Would You Like on Meat Labels?

	Age			
	19-28	29-37	38-55	Over 55
	Percent			
Additives	68.2	75.6	72.3	56.5
Nutrient content	56.9	47.4	50.4	35.1
Guaranteed free of animal drug and hormone residues	52.3	74.4	74.8	67.9

three oldest groups (encompassing ages 29 and up) had the highest percentages interested in animal drug and hormone information on the labels. Nutrient content information was of least interest to all age groups.

The survey respondents were asked to indicate how much they would be willing to pay to receive their chosen food safety information on meat labels. Most (67 percent) indicated that they would pay slightly more for additional safety information. The largest share (42 percent) said they would be willing to pay 1 to 2 cents per pound of beef for the information they want. Just over 22 percent indicated they would pay 3 to 5 cents more.

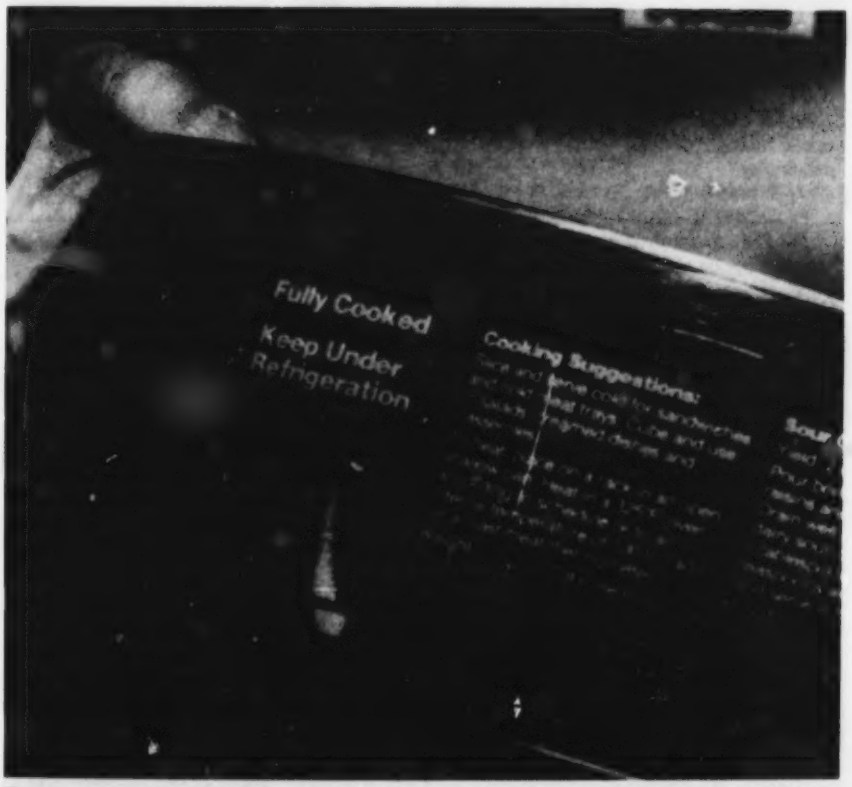
Where Consumers Go for Safety Information

As lifestyles continue to change, the methods of providing consumers with food safety information may need to adjust. Consumers in Kansas were asked to rank the most convenient way for them to receive information on food safety. Food labels ranked first. However, media tools that offer quick information were also preferred by the respondents. Newspapers ranked second overall, followed by television, radio, newsletters, and magazines. Several approaches traditionally used by the home economists of USDA's Extension Service, such as educational meetings and fact sheets or bulletins, ranked low. However, the Extension Service uses many other tools, including the media, that the consumer may not directly associate with them.

When asked how they currently received food additive information, 34 percent of the consumers surveyed answered Government literature or spokespersons, while another 19 percent received information from the food industry *(table 2)*. The share citing the Government as the source of information on animal drugs and hormones was lower, 25 percent. The industry was not identified as a primary source of information on animal drugs and hormones. Twenty-six percent replied that they did not receive any information.

Table 2. What Sources of Information Are Used?

	Food additives	Animal drugs or hormones	Pesticides	Environmental contaminants
		Percent		
Government	34.1	25.4	20.1	32.9
University	2.4	8.6	6.5	1.5
Extension agent or home economist	3.8	7.4	14.5	4.2
Food industry	19.4	3.6	2.9	3.3
Consumer group	11.8	8.9	9.2	9.5
Popular media personality	7.9	10.9	13.3	19.0
Family or friend	1.2	1.8	1.5	0.0
Sources not listed	6.5	7.1	7.7	7.1
Don't receive information	12.9	26.3	24.3	22.5



Kansas consumers ranked labels as the most convenient way to receive information on food safety.

For those who received pesticide use information, Government sources provided the most consumer information. The Extension Service programs were the next most frequent source, possibly indicating recognition of its entomology programs that focus on safe use of chemical agents while teaching pest control.

The Government was also cited as the primary source of information on environmental contamination by almost 33 percent of the respondents. Nineteen percent cited popular media personalities, who ranged from diet and exercise show hosts to news reporters, scientific experts, or Members of Congress. Almost 23 percent of consumers said they had not received any information on environmental contaminants.

Consumers were also asked how much confidence they had in their sources of food safety information. Over 90 percent indicated they had "some" to "high" confidence in information from the county extension agent or home economist *(table 3)*. University personnel ranked second, with 84 percent of consumers expressing confidence in the information they provide. Consumer groups were also an important source, followed by family and friends and Government spokespersons. Nearly 40 percent of the respondents reported little or no confidence in the information supplied by media personalities, despite their frequent use as a source. □

Table 3. How Much Confidence Is There in Information Sources?

Source	None	Little	Level of confidence Some	A lot	High
			Percent		
Government	5.8	22.1	50.5	17.1	4.5
University	6.2	10.0	45.7	28.4	9.7
Extension agent or home economist	1.6	5.3	24.8	48.3	20.0
Food industry	11.3	27.9	48.0	11.3	1.6
Consumer group	5.6	12.9	44.9	30.4	6.2
Popular media personality	14.0	24.7	47.3	12.9	1.1
Family or friend	4.5	17.1	47.2	24.0	7.2

The Survey Sample

Kansas consumers were polled by random sample in the summer of 1983. The response rate was 37 percent of the 1,100 questionnaires mailed. The survey was successful in soliciting a significant portion (40 percent) of male responses, unique to surveys of this type and important because of greater male involvement in shopping and food preparation.

Approximately 32 percent of the respondents were 19 to 37 years old. Another 32 percent were 38 to 55, and about 36 percent were over 55 years of age.

The men and women who responded had similar education levels. More than two-thirds had completed high school, 21 percent had college degrees, and 14 percent had advanced degrees. The respondents had generally higher education and income levels than the State average. Fifty-one percent reported an annual income exceeding $25,000, compared with 27 percent for the State.

The employment status of men and women respondents differed significantly. Seventy-two percent of the men indicated that they were employed, while only 38 percent of females reported employment outside the home. The sample was approximately 75 percent urban and 25 percent rural.

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When It's a Question of Meat and Poultry Safety...Call 800-535-4555

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Hotline home economists advise consumers on the safe handling of meat and poultry.

Educating the public on proper food handling practices to avoid food poisoning is a little easier because of a permanent toll-free Meat and Poultry Hotline begun last July by the U.S. Department of Agriculture. By calling 800-535-4555, consumers, businesses, and others nationwide can now get immediate answers to questions about the safe handling of meat and poultry and report any problems with these products.

An extensive system of State and Federal inspection helps assure a safe and wholesome meat and poultry supply. However, consumers and those involved in professional food preparation need to ensure that the meat and poultry they buy is properly handled. Improper thawing and cooling, inadequate cooking, and cross-contamination from raw foods can present serious problems. In fact, most of the several million reported cases of food poisoning that occur each year are due to improper handling of food.

Based on data collected during the first 8 months of the toll-free hotline's operation, 82 percent of callers requested basic food safety information, which, if followed, could reduce the number of cases of food poisoning. Over the period, 20,038 calls were made to the hotline from all 50 States and Puerto Rico. This was more than three times the number made during the entire 3 years when the hotline was not toll-free. Hotline home economists advised 10,274 callers during business hours. Approximately 90 percent of these callers were consumers *(table 1)*.

Another 1,732 persons also called during business hours but hung up when they were required to wait a short time (usually less than a minute) for a home economist to help them. The 8,032 who called after business hours and on weekends heard a recorded message on subjects ranging from safe brown bag lunches to selecting and storing turkeys for Thanksgiving. Callers were also urged to phone again weekdays from 10 a.m. to 4 p.m. eastern time.

Table 1. Who's Calling the Hotline?

User	Percent of total[1]
Consumers	90
Business	4
Government	3
Professionals	1
Media	1
Students/teachers	1

[1]Based on the 91 percent of callers who identified their "type."

Calling for Food Safety Answers

A review of the types of calls received during the 8-month period reveals the broad range of services provided by the hotline. During November, for example, more than half (1,270) of the questions concerned the safe handling of turkey for Thanksgiving. Safe storage and handling of fresh turkey was the subject most frequently asked during the 10 days before Thanksgiving. The majority of these calls were from consumers who had already purchased fresh turkeys and were concerned about extended storage times, as well as those who were deciding when to purchase a turkey for optimal freshness and safety.

Other often-heard questions included: Is it safe to cook a turkey at 250 degrees all night? Can a fresh or frozen turkey be stuffed the day before it is cooked? Is it safe to roast a turkey in a brown paper bag? *(For the answers to these important questions, see sidebar box.)*

In fact, questions about turkey were high throughout the 8 months, and more questions were received on this topic (37 percent) than any other. The majority of these questions about turkey were on storage times in the refrigerator and freezer, thawing frozen turkey, stuffing the bird, and cooking time and temperature.

Hurricane Gloria's sweep across the northeastern coast last September presented a new challenge for the hotline—helping more than 125 victims deal with the addi-

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Calling the Hotline About Turkey

Is it safe to cook a turkey at 250 degrees all night?

This method is not recommended. Because of the low temperature, the turkey (and stuffing) might take more than 4 hours to reach a high enough temperature to destroy bacteria and could, therefore, be unsafe. The quality of the turkey might suffer, too. During prolonged cooking, some parts of the turkey could become very dry.

Can a fresh or frozen turkey be stuffed the day before it is cooked?

Turkeys should be stuffed only right before cooking. It may seem like a good idea to save time by stuffing your turkey in advance, but that's inviting trouble, because harmful bacteria can multiply in the stuffing and cause food poisoning. Dry stuffing ingredients may be prepared the day before, tightly covered, and left at room temperature. The perishables (butter or margarine, mushrooms, oysters, cooked celery and onions, and broth) should be refrigerated. The ingredients should then be combined just before stuffing the turkey.

Is it safe to roast a turkey in brown paper bag?

Using ordinary brown bags for roasting is not recommended because they may not be sanitary. Also, the glue and ink used on brown bags have not been approved for use as cooking materials and may give off unhealthy fumes. Finally, as the turkey cooks, the juices may saturate the bag, causing it to break during cooking. As a result, it may be difficult to remove the bird from the pan.

The hotline has received more calls on turkey than any other topic.

tional food safety problems caused by power outages. Callers were advised on foods that could be salvaged and those that should be discarded.

Another 65 calls were received following the airing in November of a New York television story on salmonella bacteria in poultry. Some who heard the story felt that poultry might be unsafe to eat. Hotline home economists discussed the safety and wholesomeness of USDA-inspected products while reinforcing the need for basic food safety in the home. Proper handling and cooking will destroy salmonella.

Hotline Also Handles Complaints

In addition to food safety questions, callers can phone the hotline to report problems with meat and poultry products, including glass or metal fragments or a strange look or smell. The hotline home economists screen complaints to ensure they meet certain standard criteria before referring them to the Food Safety and Inspection Service's epidemiology or compliance staffs.

Complaints accounted for only 1 percent of total calls and letters received from July 1985 through February 1986. One half of these complaint calls concerned suspected cases of food poisoning or foreign objects in food. Another third were complaints about product taste or appearance. The rest were distributed over several areas, from package-related issues such as dating, labeling, additives, and contents to inspections and other plant-related concerns. □

Behind Revising the Dietary Guidelines

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What should you eat to be healthy? In 1980, this question was addressed by nutrition scientists in the U.S. Departments of Agriculture (USDA) and Health and Human Services (DHHS) in a joint publication "Nutrition and Your Health: Dietary Guidelines for Americans." A second edition of that publication was released in 1985, incorporating recommendations of a nine-member Dietary Guidelines Advisory Committee.

The guidelines in the second edition are similar to those in the 1980 edition in many ways. For example, the new guidelines are for the same audience, namely healthy Americans. The guidelines are especially appropriate for people who have risk factors for chronic diseases such as a family history of obesity, premature heart disease, diabetes, high blood pressure, and high blood cholesterol levels. Like the 1980 edition, the new guidelines do not apply to people who need special diets because of disease or conditions that interfere with normal nutritional requirements. These people may require special instructions from health professionals.

Looking at the 1980 Guidelines

After extensive review of the scientific literature, hundreds of solicited comments from the public, and discussion at four meetings, the Dietary Guidelines Advisory Committee suggested retaining the seven guidelines covering the same dietary issues as in the earlier edition. However, the committee changed the wording of two guidelines. "Maintain ideal weight" was changed to "Maintain desirable weight" because the word "ideal" seemed to imply an unduly precise understanding of what people should weigh. "If you drink alcohol..." was changed to the more correct wording, "If you drink alcoholic beverages..." *(see figure for all seven guidelines).*

Once again, in the new edition the seven guidelines emphasize variety, balance, and moderation in the total diet. The first two guidelines—on variety and weight maintenance—are the framework for a good diet, and the next five guidelines describe special characteristics of a good diet. The importance of integrating all of the guidelines into the diet is also stressed in the new edition. Because they refer to the total diet, the guidelines do not recommend eliminating any food or group of foods from the diet.

As in 1980, the new edition of the guidelines does not recommend specific amounts of vitamins, minerals, fat, sugar, sodium, alcohol, starch, or fiber. And except for nutrients for which there are Recommended Dietary Allowances, members of the Dietary Guidelines Advisory Committee believed that in order to recommend specific goals they must await further research. However, they did suggest that the U.S. population as a whole choose diets that are reduced in calories (primarily from fats, sugars, and alcohol) and increased in dietary starch and fiber.

Some new cautions have been introduced in the latest edition of the dietary guidelines publication. For example, readers will find recommendations to avoid large-dose supplements of any nutrient, not to attempt to lose weight by inducing vomiting or by using laxatives, and to moderate their use of egg yolks (not eggs). The publication also warns that consuming excess calories, as well as extra saturated fat and high levels of dietary cholesterol, will increase blood cholesterol levels in many people.

The revised guidelines publication also points out that recent research suggests that calcium may play a role in preventing osteoporosis and that, while sodium intake is one of the factors known to affect high blood pressure, several other nutrients may be involved. Obesity plays a major role too. About one in four adults has elevated blood pressure, according to the 1985 edition.

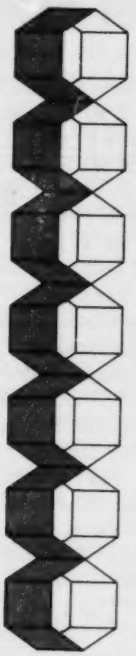
Other examples of information in the revised Dietary Guidelines include: (1) that common table sugar (sucrose) is only one form of sugar, and (2) both sugars and starches appear to increase the risk of tooth decay when eaten between meals, but simple sugars appear to offer a higher risk.

In keeping with the goal of providing guidance for a healthier diet and lifestyle, the 1985 edition also includes advice from the National Institute of Alcohol Abuse and Alcoholism: Pregnant women should refrain from using alcohol because research has not established the level of consumption at which risks to the unborn occur; and if you drink, don't drive.

Getting the Word Out

The Dietary Guidelines Advisory Committee recommended that USDA and DHHS publish and widely distribute the revised guidelines; that these departments use the guidelines as the basis for their nutrition education and information programs; that USDA develop dietary guidance related to

The 1985 Dietary Guidelines for Americans


Eat a Variety of Foods
Maintain Desirable Weight
Avoid Too Much Fat, Saturated Fat, and Cholesterol
Eat Foods with Adequate Starch and Fiber
Avoid Too Much Sugar
Avoid Too Much Sodium
If You Drink Alcoholic Beverages, Do So In Moderation

Second Edition. 1985
U.S. Department of Agriculture
U.S. Department of Health and Human Services

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USDA Actions

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the guideline concepts for nutrition education programs; and that other advisory committees of nationally recognized nutrition authorities be convened on a 5- to 10-year cycle to review the guidelines for scientific accuracy and appropriateness.

A series of 14 short bulletins to help Americans put the guidelines into practice are being developed by USDA's Human Nutrition Information Service with advice from the Extension Service. The first set of seven bulletins, scheduled for release in mid-1986, will present information about each guideline and the dietary substances, such as vitamins, minerals, fat, starch, fiber, sodium, or sugar, featured in the guidelines. The next set of seven bulletins, scheduled for release later this year, will show how to integrate the guidelines while shopping for food, planning meals, preparing food, eating out, making bag lunches, preparing quick meals, and choosing snacks. □

Where To Get the Guidelines

A single free copy of "Nutrition and Your Health: Dietary Guidelines for Americans," Second Edition, Home and Garden Bulletin No. 232 is available by writing to the Consumer Information Center, Pueblo, Colorado 81009. The food industry and other groups are encouraged to reprint the guidelines bulletin for distribution, using copy available from USDA's Office of Governmental and Public Affairs, Washington, D.C. 20250.

For a list of some of the Federal Government's materials that are related to dietary guideline issues and for information about the 14 new short bulletins, write to the Human Nutrition Information Service, U.S. Department of Agriculture, Room 364, Federal Building, Hyattsville, MD 20782.

USDA regularly implements operational and regulatory changes that affect the status of food and nutrition in the United States. Here are some actions relevant to the food situation.

New Agriculture Secretary: Richard E. Lyng was sworn in as the 22nd U.S. Secretary of Agriculture on March 6, 1986. Lyng was born June 29, 1918, in San Francisco, and graduated from the University of Notre Dame in 1940. From 1949 to 1967, Lyng served as president of the Ed. J. Lyng Company, a family-owned seed and bean production and processing company in Modesto, Calif. He was appointed director of the California State Department of Agriculture by Governor Reagan in 1967 and served in that post until 1969, when he was appointed USDA's Assistant Secretary for Marketing and Consumer Services. From 1973 to 1979, Lyng was president of the American Meat Institute. He also has served as a director of Tri-Valley Growers in San Francisco; the Chicago Mercantile Exchange; the Agribusiness Advisory Board, University of Santa Clara; and as a member of the Animal Health Committee of the National Academy of Sciences. Lyng was the transition team leader for USDA after Reagan's election in 1980 and then served as USDA's Deputy Secretary of Agriculture during the first term of the Reagan Administration.

Oriental Fruit Fly Quarantines: On November 21, 1985, USDA quarantined an area in Santa Clara County, Calif., to help prevent the spread of the oriental fruit fly, one of the world's most destructive fruit and vegetable pests. In October, USDA quarantined parts of California's Los Angeles and Orange Counties for oriental fruit fly. The quarantines restrict movement of around 100 kinds of fruits, nuts, vegetables, and berries from the quarantined areas. Before any of the regulated items can be moved interstate, a permit must be obtained from USDA.

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Richard E. Lyng: new Secretary of Agriculture

Identification Devices on Cattle and Swine: Individual identification devices on cattle and swine moving in interstate commerce are now required to remain on the animals from point of origin through final destination. Formerly, the identification devices were required only at the time of actual movement across a State line. The purpose of identification devices, such as eartags, backtags, brands, and tattoos, is to provide a means of tracing an animal to its original source in case of disease outbreak, and to help identify any other animals that may have been exposed.

Pseudorabies: USDA has amended its pseudorabies control regulations in an attempt to "establish a balance between adequate protection against the spread of pseudorabies in swine and needless interference in the movement of swine between States," according to Bert W. Hawkins, administrator of USDA's Animal and Plant Health Inspection Service. The changes clarify the regulations, remove inconsistencies, and bring the rules in line with current

industry practices. Specifically, the changes provide an alternative method for removing swine herds from the "known infected" classification, an alternate method for attaining or regaining herd "qualified pseudorabies-negative" status, an improved method for monitoring herds vaccinated for pseudorabies, and an alternate way for shippers to move swine interstate to approved livestock markets, feedlots, and quarantined herds.

Citrus Canker: Regulations have been changed to allow Florida citrus seed to move to other States, Florida citrus fruit to move to northern Louisiana, and citrus fruit from other areas to move through Florida to other States. Citrus previously eligible may continue to be shipped. Movement of Florida citrus has been restricted since September 1984, shortly after a strain of citrus canker, a destructive foreign citrus disease, was found in a Florida citrus nursery. To be eligible for interstate movement, citrus must come from a grove free of citrus canker and must undergo disinfection. Also, canker-free citrus must be accompanied by a permit and be moving to a noncitrus-producing area.

Hops: USDA terminated Marketing Order 991 governing the marketing of domestically produced hops on December 31, 1985. The decision to terminate the order was reached after analysis of the industry's problems and a review of the record of a public hearing held to consider amendments to the order. The marketing order had been in operation since 1966.

WIC Study: On January 10, 1986, USDA released the results of a 5-year study assessing the effectiveness of the Special Supplemental Food Program for Women, Infants, and Children (WIC). Objectives of the study included an assessment of the effect of the WIC program on pregnant women in terms of pregnancy outcomes, nutrition and diet, and utilization of professional health care. The study also examined the effect of WIC on children, including growth, dietary intake, and health care.

The study showed that the WIC program increases the use of infant formula instead of cow's milk, improves some dietary factors associated with pregnant women's weight gain, and encourages use of prenatal care. The study's findings on length of pregnancy and pregnancy outcomes were mixed. While results from one portion of the evaluation indicate WIC is effective in increasing the length of pregnancy by 1 day, and in reducing the likelihood of both premature delivery and fetal death, these results could not be confirmed by another portion of the evaluation. Contrary to expectations, the study did not find consistent evidence that WIC increases the birth weight of infants.

WIC program recipients receive a monthly package of food tailored to their nutritional needs, as well as nutrition education and referral to health care. In fiscal 1985, the WIC program cost approximately $1.5 billion and served more than 3.1 million people a month.

Egg Marketing Order: USDA held public hearings in Atlanta, Little Rock, San Francisco, Philadelphia, and Chicago during January and February 1986 to consider a proposal to establish a Federal marketing order for eggs. The proposed order would: establish an egg research and promotion program, including the use of paid advertising; authorize regulations to take fowl out of production during periods of extreme egg surpluses; and establish a national board of producers and handlers to execute the order. The provisions of the proposed order were submitted to USDA by an egg industry task force. Based on testimony presented at the hearings, the Secretary of Agriculture will issue a recommended decision on the marketing order.

Poultry Inspection: USDA continued its inspection modernization program by implementing a new, lower cost inspection method in poultry slaughter plants. The new procedure is mandatory in poultry plants that operate under the Modified Traditional Inspection System. The vast majority of plants that slaughter young chickens use this system. The traditional inspection procedure divided the inspection process among three inspectors. The first inspector, using a mirror, checked the outside of each carcass. The other two inspectors checked the inside cavity and the internal organs. The trimming of bruises and other defects was done by plant employees under the direction of an inspector. The new procedure, called the Streamlined Inspection System, eliminates the first inspector. Instead one or two inspectors are used, depending on the size of the plant, and each is responsible for checking a whole bird. Plant employees identify and trim bruises and other defects, allowing USDA inspectors to concentrate on detecting disease and other abnormalities.

Flavor Enhancer: USDA now permits processors to use monoammonium glutamate as an alternative flavor enhancer in various meat and poultry products. Monoammonium glutamate is classified as a multiple-purpose food substance that is generally recognized as safe by the Food and Drug Administration. Monoammonium glutamate has the same effect as monosodium glutamate in food, but it does not contain sodium.

Meat Grading and Certification Fees: USDA has increased the hourly fee it charges for meat grading and certification services and has established separate fee rates for different types of service. Meat grading and certification services are provided to meatpackers and processors at their request. By law, the fee must be about equal to the cost of providing the service. A higher fee was needed to offset substantial losses from operating the program in fiscal 1985. The establishment of separate fee rates for different types of service will distribute more equitably the program's operating expenses to meatpackers and processors.

There are two types of applicants: commitment and noncommitment. Commitment applicants agree to guarantee 40 hours of revenue for service per week. Noncommitment applicants request service for a particular day and for the amount of time necessary to complete a specific task. The cost of providing service to noncommitment applicants is higher than the cost of providing service to commitment applicants. Under the new fee schedule, the base rate for commitment applicants will be $27.40 per hour, and the base rate for noncommitment applicants will be $29.80. All applicants

USDA continued its inspection modernization program by implementing a new, lower cost inspection method in poultry slaughter plants.

will be charged $54.80 per hour for services performed on Federal holidays and $35.40 during premium hours (time in excess of 8 hours per day between 6:00 a.m. and 6:00 p.m.; hours worked before 6:00 a.m. and after 6:00 p.m., Monday through Friday; and any hours worked on Saturday and Sunday).

Mango Imports: USDA is again allowing mangoes from Central America, the West Indies, Brazil, and Mexico to be imported into the United States. Mangoes from these areas had been prohibited entry since September 17, 1985, when the Environmental Protection Agency ruled that residues of ethylene dibromide (EDB) on mangoes would no longer be allowed. Prior to September 17, treatment of mangoes with EDB in the country of origin was required to destroy tropical fruit fly larvae before they could be imported. The ban of EDB effectively eliminated importation of mangoes from countries infested with tropical fruit flies, since no alternative treatments are available. On February 14, 1986, however, the Environmental Protection Agency reestablished a tolerance of .03 parts per million of EDB for mangoes, which made it possible for USDA to reissue the regulations. These regulations describe proper fumigation standards and how the required USDA import certificates should be obtained. Fumigation must be done under USDA supervision in facilities approved by USDA.

Sugar Import Quota: The 1986 quota year for sugar imports will end on December 31, 1986, instead of September 30. The quota year began on December 1, 1985. The 3-month extension was necessary to comply with the provisions of the Food Security Act of 1985. The 1986 base quota amount of 1.72 million short tons will now enter the United States over a 13-month period, rather than 10 months. This effectively reduces by more than 20 percent the amount of quota sugar that will be imported during the period ending September 30, 1986, since shipping patterns will be adjusted to assure that sugar arrives evenly during the extended period.

Milk Marketing Orders: USDA held four regional hearings to consider proposals to amend the location adjustment provisions in Federal milk marketing orders. The proposals, submitted by cooperative associations and dairy processors, would modify the plant location adjustments to prices under the orders to conform with the Class I price differentials mandated by the Food Security Act of 1985. The hearings were held on February 25, March 4, 12, and April 8 in Atlanta, Ga.; Irving, Tex.; Indianapolis, Ind.; and Minneapolis, Minn., respectively.

Fresh Fruit and Vegetable Grading Fees: USDA has increased the fees it charges to inspect and grade fresh fruits and vegetables at destination markets. The fees were raised to cover increased costs of providing the services. The new schedule raises fees for examining both the quality and condition of a product, or its condition only. Users of the service will be charged $50 to inspect more than half a carlot of a product for quality and condition, $42 for each half-carlot equivalent or less of an individual product, and $100 maximum for each carlot equivalent when more than one kind of product is involved. A carlot equivalent is approximately 40,000 pounds.

For condition inspection only, producers will be charged $42 when the volume of a product is in excess of one-half carlot and $38 for each half-carlot or less of an individual product. A maximum of $84 will be charged when more than one kind of product is involved. Rates for inspection on a per hour basis, small package inspection

Food and Nutrition Legislation

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fees, and the inspection charges for peanuts, pecans, and other nuts were also raised.

Meat and Poultry Labels: USDA has changed its definitions for the terms "lite," "lean," and other claims used on meat and poultry labels to reflect more accurately a product's fat content. USDA also is requiring specific labeling information on products using these terms. Processors will have 1 year to change their labels in accordance with the new requirements.

The new labeling requirements are designed to ensure that products labeled with terms indicating lower fat levels are naturally low in fat or that their fat content has actually been reduced. Processors must disclose the actual amount of fat (expressed as a percentage) on the product label. Under the new definitions, the term "extra lean" will be reserved for products containing no more than 5 percent fat. The terms "lean" and "low fat" can be used only on products containing less than 10 percent fat. The terms "light," "lite," "leaner," and "lower fat" can only be used on products containing at least 25 percent less fat than the majority of such products in the marketplace. A statement explaining the comparison must be included on the label. For example, the label for "Leaner Ground Beef" might include "This product contains 20 percent fat, which is 33 percent less fat than is in most ground beef."

The terms "lean," "lite," or other fat claims can be part of fanciful names, brand names, and trademarks only if the product meets the requirements for that claim and if the claim is explained on the label. This restriction, however, does not apply to the use of these terms on brand-name products like frozen dinners and entrees when the terms indicate a product's usefulness in calorie control. Labels on these products must carry nutrition labeling that includes the fat content. Previous labeling requirements allowed terms such as "lite," "lean," and "extra lean" to be used interchangeably on meat and poultry products containing 25 percent less fat than a comparable product and on products containing no more than 10 percent fat overall. □

Numerous food and nutrition bills have been introduced in Congress. One recently passed law and several proposals are briefly described below.

Food Assistance

P.L. 99-269

The Older Americans Amendment Act was passed by Congress on March 18, 1986, and was signed by the President on April 1. The Act continues the Surplus Commodities Program operated by the Department of Health and Human Services. The program provides all persons aged 60 and over, and their spouses, with nutritionally sound meals at little or no cost to participants. USDA provides commodities or cash in lieu of commodities to the program. Under this Act, USDA will pay no more than 56.76 cents per meal, whether it is provided by communal feeding operations or home delivered. Total program expenditures cannot exceed $144 million each year for fiscal 1986 and 1987. The Act requires that the Secretaries of Agriculture and of Health and Human Services disseminate program operation and procedure information to all State and local agencies affected by any Federal programs that disperse commodities.

H.R. 4182—Rep. Bernard Dwyer (NJ)

The bill would amend the Food Stamp Act of 1977 to exclude the income received by the handicapped employed in sheltered workshops from food stamp eligibility and benefit calculations. The bill defines a sheltered workshop as a program established by a nonprofit organization that provides the handicapped with employment or other educational or therapeutic occupational activities.

H.R. 4405—Rep. Jerry Huckaby (LA)

The bill would give a State the right to collect State and local sales taxes on purchases made with food stamp coupons. Current law, the Food Security Act of 1985, bars States from participating in the Food Stamp Program if State and local taxes are collected on such purchases.

S. 2182—Sen. Quentin Burdick (ND)

This bill would amend the Food Stamp Act of 1977 to allow households to reduce their countable income by the amount of self-employment losses when applying for the Food Stamp Program. A similar provision, applicable to farmers only, was added by the Food Security Act of 1985.

Food Safety and Quality

H.R. 4269—Rep. James Cooper (TN)

The Lite Food Labeling Act would require uniform minimum standards for the "lite" categories of foods, such as those that are advertised as less-fat, low-calorie, or reduced-sodium. This legislation would establish standards for the terms "lite" or "light" and "reduced." The terms "lite" or "light" could be used only if the actual calorie, fat, or sodium percentage changes that form the basis for the comparative claims are displayed prominently on the labels. Food products of not more than 40 percent meat or poultry, such as meat-topped pizza, can only use the term "reduced" if they contain at least one-third fewer calories, three-fourths less sodium, or one-half less fat than their regular counterparts. Foods with more than 40 percent meat or poultry, such as hotdogs, have identical calorie and sodium restrictions, but can use the term "reduced fat" only when there is at least one-third less fat than their unaltered counterparts.

H.R. 4277—Rep. Mel Levine (CA)

This bill would direct the Food and Drug Administration (FDA) to study and report on toxic contamination of fish in Santa Monica Bay. It would require the FDA to assess the level of contamination of edible fish from the bay, to determine the rate of consumption of the area's contaminated fish by surrounding communities, and to evaluate the health risks associated with such consumption.

The author was with the Food and Agricultural Policy Branch of the National Economics Division.

H.R. 4364—Rep. Berkley Bedell (IA)
S. 2215—Sen. Richard Lugar (IN)

These identical bills are designed to better protect the public and environment from pesticides than is possible under the current law, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). These bills would require review and reregistration of pesticides currently used and increased public access to data resulting from the review. They would authorize:

- A schedule for the completion of reregistration (especially of those pesticides marketed prior to the passage of FIFRA in 1972).
- A one-time fee for reregistration to defray registration costs.
- Interim reviews of pesticides and coordinated inspection of laboratories.
- A review of imported pesticides to see that domestic health and safety regulations are applied.
- Increased employee protection against discharge or discrimination for participating in any way with reregistration hearings.
- Limited conditional registration of a pesticide, pending completed review of its health and safety data.
- A required, manufacturer-provided summary of an approved pesticide's health and safety data, available to the public upon request.
- Limited public access to similar data prior to the Environmental Protection Agency's approval of a pesticide.

Other Legislation

H.R. 4008—Rep. Arlan Stangeland (MN)

This bill is designed to help create new jobs and revitalize economically distressed rural areas. It would establish "rural enterprise zones" by streamlining government requirements within the area, reducing tax rates for local businesses, offering State or local income tax deductions to those who perform services formerly performed by government, and offering surplus land in the zone at a reduced price to neighborhood groups agreeing to operate a business on the land. Emphasis would be put on disadvantaged workers and long-term unemployed individuals. □

Provisions of the Food Security Act Related to the Food Sector

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The Food Security Act of 1985 (P.L. 99-198) provides a 5-year framework for the Secretary of Agriculture to administer various agriculture and food programs. This article summarizes the dairy, marketing, and miscellaneous provisions that may be of interest to *National Food Review* readers. For a full summary of the 1985 Act see *Provisions of the Food Security Act of 1985*, Agricultural Information Bulletin-498.

The Food Security Act was passed by Congress on December 18 and signed by President Reagan on December 23, 1985. The Food Security Improvements Act of 1986 (P.L.99-260), which made "technical corrections" in the 1985 Act, was passed by Congress on March 11 and signed by the President on March 20, 1986.

Dairy Provisions

Milk Production Termination Program: In an attempt to permanently reduce milk production, Congress included a milk production termination or "whole herd buyout" program in the Food Security Act. The buyout program began April 1, 1986, and will run through September 30, 1987. Participating producers submitted bids based on milk marketings during July 1984 through June 1985, or their calendar 1985 marketings, whichever was smaller.

In return for payment of these bids, participating producers agreed to end all milk production, liquidate or export their herds, and stay out of dairying for 5 years. During this time, producers may not acquire interest in dairy cattle or milk production, or allow other dairy farmers to use their facilities.

Program participants must provide evidence of their milk marketing history and the past and present size and composition of their herds. A producer who began marketing milk in the 15-month period ending March 31, 1986, was ineligible to participate, except if the entire herd and facilities were transferred to the producer as a gift or inheritance from a family member.

To help offset the cost of the milk production termination program, the price of milk received by producers will be reduced 40 cents per hundredweight (cwt) during April 1-December 31, 1986, and 25 cents per cwt during January 1-September 30, 1987. This deduction will be collected by handlers and remitted to the Commodity Credit Corporation (CCC). The deduction is applicable to all milk marketed for commercial use in the continental United States (excluding Alaska). The Food Security Improvements Act requires an additional deduction of as much as 12 cents per cwt during April 1—September 30, 1986, in lieu of the March 1 reductions in price support payments mandated by the Balanced Budget and Emergency Deficit Control Act of 1985 (popularly known as Gramm-Rudman-Hollings). The change was made so that the cuts required by Gramm-Rudman-Hollings would be borne by all producers; a decrease in price support payments would have affected only those selling surplus dairy products to the CCC.

The goal of the program is to reduce milk production by 12 billion pounds. However, the total number of dairy cattle marketed for slaughter under this program is limited to 7 percent of the national dairy herd in addition to the normal culling rate per calendar year. The Secretary of Agriculture may establish a milk diversion or a milk production termination program in 1988, 1989, or 1990, if it is deemed necessary to avoid burdensome excess stocks of milk or milk products.

To minimize the effect of the 18-month program on beef, pork, and lamb producers, the Secretary must purchase 400 million pounds of red meat in addition to those normally purchased and distributed. Two hundred million pounds will be distributed through domestic programs and 200 million through export programs and military commissaries located outside the United States.

Milk Marketing Orders: The Food Security Act specifies minimum Class I differentials for the 44 milk marketing orders administered by USDA's Agricultural Mar-

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In attempt to permanently reduce milk production, Congress included a milk production termination or "whole herd buyout" program in the Food Security Act of 1985.

keting Service (AMS). These differentials, which range from $1.35 to $4.18 per cwt of milk having 3.5 percent milk fat, are the dollar amounts added to the price of manufacturing grade milk in the Minnesota-Wisconsin marketing area to determine the minimum Class I (bottling) milk price that handlers must pay under each of the marketing orders. The minimum differentials will be in effect for the 2 years beginning May 1, 1986, and will continue in effect unless an order is amended by AMS.

The Minnesota-Wisconsin price is an estimate of the average price paid for manufacturing grade milk used to make butter, nonfat dry milk, and cheese at plants in most of Minnesota and Wisconsin. Under Federal milk marketing orders, milk is priced according to how it is used at processing plants. Milk sold for drinking is in the highest price class (Class I), while milk used in manufactured products is in lower price classes. Congress felt it necessary to adjust the differentials so that the minimum Class I prices would better cover the costs of supplying the markets.

National Commission on Dairy Policy: As part of the Food Security Act, Congress established a National Commission on Dairy Policy to study the future operations of the Federal milk price support program. The commission will have 18 members, appointed by the Secretary, who are engaged in commercial milk production in the United States.

The commission will examine the current Federal price support program for milk, alternatives to the program, the effect that emerging dairy technologies will have on surplus milk production, and the future structure of the milk production industry.

The commission will be dissolved after submitting its findings and recommendations to the Secretary of Agriculture and Congress on or before March 31, 1987.

Research and Promotion Programs

The Food Security Act establishes procedures for carrying out research and promotion programs for beef, pork, and watermelons designed to strengthen these industries' positions in the marketplace and maintain and expand markets and uses of the products *(table 1)*. Federally legislated research and promotion programs are one method producers have used to foster demand for their products. Of the promotion programs enacted by Congress in the last 30 years, six are still in effect (cotton, dairy, eggs, potatoes, wheat, and wool).

Beef: Provisions of the Food Security Act establishing a beef research and promotion order replace the Beef Research and Information Act of 1976. The 1985 Act establishes a Cattlemen's Beef Promotion and Research Board composed of beef producers and importers. Producer representation on the board will be based on one representative for each State with 500,000 or more cattle. Those States with fewer than 500,000 cattle will be combined into regional units containing at least 500,000 cattle, with one representative for the region. States with over 500,000 head will get one more representative for each additional million cattle. The Secretary of Agriculture will determine importer representation by converting the volume of imported beef and beef products into live-animal equivalents.

The board will administer the order, investigate violations of the order, and recommend order amendments to the Secretary. In addition, the board elects 10 members to serve on the Beef Promotion Operating Committee. Another 10 members of the committee are from recognized beef promotion organizations in the States. The committee is charged with developing the actual research and promotion projects.

Financing for the program will be provided through assessments collected from beef importers and persons buying cattle from producers. The assessment rate will be $1 per head of cattle, or the equivalent thereof in the case of imported beef and beef products. Producers who participate in programs run by State beef councils will receive credit of up to 50 cents per head. Persons not supporting the program may receive a one-time refund. Funds collected by the board cannot be used to influence Government policy.

For the order to remain in effect, a referendum to continue the order must be conducted among producers and importers not later than 22 months after issuance of the order. Continuation of the order requires majority approval. The Secretary may also conduct a referendum concerning program continuation on request of 10 percent or more of producers. This order does not preempt or supersede other beef promotion programs operated in the United States.

Pork: The Food Security Act also requires an order establishing a pork research and promotion program. A National Pork Producers Delegate Body is established as

part of the order. It will consist of producers and importers appointed by the Secretary from nominees selected by State-recognized organizations of pork producers or a suitable substitute as defined in the legislation. At least two producer members must be appointed to the Delegate Body from each State, with additional membership also allowed. For 1986, additional members will be assigned based on one share for each $400,000 of hogs marketed. Shares assigned to importers for 1986 will be based on one share for each $575,000 worth of hogs, pork, or pork products imported. In subsequent years, shares for both domestic producers and importers will be based on the amount of assessments collected, minus refunds.

The order also provides for a 15-member National Pork Board composed of producers representing at least 12 States and importers. The Secretary of Agriculture will appoint the members from nominees submitted by the Delegate Body. The board must develop promotion, research, and consumer information projects; submit such projects to the Secretary for approval; administer the order; investigate alleged violations of the order; and recommend order amendments to the Secretary.

The assessment rate to finance the order will initially be the lesser of 0.25 percent of the market value of hogs, pork, or pork products sold or imported or an amount established by the Secretary based on a recommendation by the Delegate Body. The rate may be increased, but by not more than 0.1 percent per year, with an upper limit on the total assessment rate of 0.5 percent. Any increase in the rate above 0.5 percent must be approved by producers and importers in a referendum. Any person who paid the assessment but does not support the program may receive a refund.

For the order to remain in force, a referendum must be held between 24 and 30 months after the issuance of the order. Continuation of the order requires majority approval of producers and importers voting in the referendum. Further referenda, to determine termination or suspension of the order, may be conducted on request of 15 percent or more of producers and importers during a representative period. The Secretary need not conduct more than one referendum in a 2-year period.

States may not impose additional or different regulations relating to pork promotion, except regulations related to public health, during the time that assessments are collected.

Watermelons: The third promotion program (called a plan) will cover watermelons. When sufficient evidence, as determined by the Secretary of Agriculture, is presented by watermelon producers and handlers, or whenever the Secretary has

Table 1. Food Security Act Establishes Beef, Pork, and Watermelon Promotion Programs

Item	Beef order	Pork order	Watermelon plan
Implementation	Mandatory	Mandatory	Based on Secretary's findings
Effective date	120 days after publication of proposed order	90 days after issuance of final order	Not specified
Persons affected	Beef producers and importers	Pork producers and importers	Watermelon producers and handlers
Administrative organizations	Cattlemen's Beef Promotion and Research Board	National Pork Producers Delegate Body	National Watermelon Promotion Board
	Beef Promotion Operating Committee	National Pork Board	
Assessment rate	$1 per head of cattle or the equivalent for beef and beef products	0.25-0.50 percent of the market value of hogs or pork	Equal amounts from producers and handlers
Referendum			
Date	Not later than 22 months after issuance of the order	24 to 30 months after issuance of the order	Not specified
Approval required for—			
Continuation	Majority of those voting	Majority of those voting	NA
Implementation	NA	NA	2/3 of those voting (or those voting who control 2/3 of the watermelons produced and handled during a specified period) and a majority of both producers and handlers voting.

NA = Not applicable.

reason to believe that a research and promotion plan is needed, hearings will be held on a proposed plan. Based on evidence presented at the hearing, a watermelon promotion plan must be issued if the Secretary finds it would carry out the purposes previously stated.

The plan would establish a National Watermelon Promotion Board composed of an equal number of producer and handler representatives and a public representative. Producers and handlers would submit nominations to the Secretary. If established, the board would develop research and promotion projects, which must be approved by the Secretary before they are implemented. The board will also administer the plan, investigate alleged violations, and recommend amendments to the Secretary.

Assessments, which would be set by the board, must be the same on a per unit basis for both producers and handlers. Handlers would be responsible for collecting assessments from producers and submitting them to the board. All watermelon producers or handlers who do not support the plan could request a refund. Assessments may not be used to advertise or promote private brand names, to make false or unwarranted claims of watermelons or uses of competing products, or to influence Government policy.

If a plan is issued, the Secretary must conduct a referendum at county extension offices among eligible producers and handlers to ascertain whether they favor the plan. For a plan to be implemented, it must be approved by two-thirds of those voting in the referendum (or by voting producers and handlers who have control of two-thirds of the watermelons produced and handled during a representative period) and by a majority of both producers and handlers voting. The Secretary may conduct further referenda at any time, at the request of the board, or at the request of at least 10 percent of the watermelon producers and handlers eligible to vote in a referendum. The Secretary must discontinue the plan when its termination or suspension is favored by a majority of those voting in the referendum and by those producers and handlers voting who control more than 50 percent of the total volume of watermelons produced and handled by those voting in the referendum.

New Requirements for Agricultural Imports

The Food Security Act also addresses U.S. imports of poultry, red meat, and live animals. The act requires that all edible poultry imported into the United States since May 23, 1986, be subject to the same inspection, sanitary, quality, species verification, and residue standards that apply to poultry produced in the United States. The poultry must also be processed in facilities with conditions comparable to U.S. plants. Poultry not meeting U.S. standards will be denied entry.

In addition, each foreign country that exports red meat to the United States must obtain a certificate issued by the Secretary of Agriculture stating that the country uses reliable analytical methods to ensure compliance with U.S. standards for residues in meat. The Food Security Act stipulates that no red meat will be permitted entry from a country that does not obtain a certificate. The Secretary may issue regulations under which cattle, sheep, hogs, goats, and other animals that have been administered an animal drug banned for use in the United States may be imported for human consumption.

The Comptroller General must study USDA's and the Department of Health and Human Services' current product purity and inspection regulations for imported food products. The study must evaluate the effectiveness of Federal regulations and inspection procedures to detect prohibited chemical residues and foreign matter in food or live animals. A report is due to Congress by December 23, 1986.

National Agricultural Policy Commission

Because of the poor health of the agricultural economy, Congress established a National Commission on Agricultural Policy in the Food Security Act. The Commission's purpose is to study the structure, procedures, and methods of formulating and administering U.S. agricultural policies, programs, and practices. Specifically, the Commission must examine the following:

- The effectiveness of existing agricultural programs in improving farm income.
- Possible program improvements to help retain the family farm.
- The effect of legislative and administrative changes to agricultural policy on planning and long-term profitability of farmers.
- The effect on farmers of the existing system of formulating and implementing agricultural policy.
- The effect of national and international economic trends on U.S. agricultural production.
- The means of adjusting U.S. agricultural policies and programs to meet changing economic conditions.
- The role of State and local governments in future agricultural policy.

The Commission must also study conditions in rural areas of the United States and how these conditions relate to the provision of public services by Federal, State, and local governments. The rural issues to be examined will include the following:

- An analysis of conditions that reflect the declining rural economy, including economic and demographic trends, and rural and agricultural income and debt.
- Trends and fiscal conditions of rural local governments.
- Trends of Federal, State, and local government financing, delivery, and regulation of public services in rural areas.

The Commission must submit annual reports of findings and recommendations to the President and Congress before December 23 each year of the Commission's existence. The Commission is scheduled to terminate on December 23, 1990.

The Commission will include the chairmen and ranking minority members of the House and Senate agriculture committees and 15 members appointed by the President. The appointed members will be selected from nominees representing producers, processors, exporters, transporters, shippers, input suppliers, credit institutions, and consumers. Each State Governor will nominate two to four potential members. The President may not appoint more than one individual from a particular State nor more than seven individuals of the same political party. □

Recent Trends in Domestic Food Programs

Masao Matsumoto and Joyce Allen
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Participation and program costs discussed in this article compare the October-December quarter of 1985 with the same 3 months of 1984. The data reported were compiled in February 1986 and are subject to revision.

An average of 19.4 million persons participated monthly in the Food Stamp Program during October-December 1985. This represented a 2.5-percent decline from 19.9 million participants in the fourth quarter of 1984. Reduced participation lowered total program costs from $2.95 billion in 1984 to $2.93 billion in 1985.

Federal expenditures for benefits declined by $46 million, from $2.70 billion in the fourth quarter of 1984 to $2.66 billion in 1985, while average monthly food stamp benefits per person increased from $45.19 to $45.76. Administrative expenses in the same quarter increased from $221 million to $242 million. Other program costs rose from $23 million to $28 million.

Child Nutrition Programs

Average participation per school day in the National School Lunch Program rose 0.8 percent, from 23.9 million in the fourth quarter of 1984 to 24.1 million in 1985. The number of students receiving free lunches increased slightly from 10.0 million in 1984 to 10.1 million in 1985, and those receiving reduced-price lunches rose from 1.62 to 1.63 million. Students that paid full price for lunch increased from 12.2 to 12.4 million per day. During the last quarter of 1985, students receiving free lunches, reduced-priced lunches, and full-price lunches remained at approximately the same proportions as in 1984: 42, 7, and 51 percent, respectively.

Schools participating in the National School Lunch Program are entitled to receive per-meal cash payments which vary according to the type of lunch served. Participating schools also receive 11.75 cents per meal in commodities. Federal cash expenditures for the program totaled $833 million during the last quarter of 1985, up from $801 million the previous year. The value of commodities distributed to schools dropped slightly from $146.8 million to $146.2 million.

In addition, schools also receive "bonus" commodities, such as dairy products, that benefit the lunch program and serve as an outlet for surplus commodities purchased by the Federal Government. The value of bonus commodities distributed to schools totaled $127 million, up from $95 million a year earlier.

Participation in the School Breakfast Program increased from 3.49 million to 3.57 million per day. Free, reduced-price, and full-price meals all increased, with full-price meal participants leading the gains. Approximately 88.4 percent of the participants received either a free or a reduced-price breakfast. Cash payments for the program amounted to $125.6 million, compared with $118.5 million in the last quarter of 1984.

The number of meals served under the Child Care Food Program rose from 161.6 million to 169.7 million, an increase of 5 percent. Federal cash expenditures rose by nearly $8.2 million, from $98.5 million to $106.7 million. Total expenditures (including commodities and administrative costs) were $119.4 million, up from $111.5 million.

About 42 million half-pints of milk were served under the Special Milk Program during the fourth quarter of 1985, compared with 44 million in 1984. The reduced volume lowered Federal expenditures from $4.2 million to $4.1 million.

Supplemental Food Programs

Participation in the Special Supplemental Food Program for Women, Infants, and Children (WIC) reached a record 3.3 million during October-December 1985, up from 3.1 million in the same quarter of

Participation in the WIC program reached a record 3.3 million during the last quarter of 1985.

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Who Accepts Food Stamps?

Where can Food Stamp Program participants purchase food with their coupons? In a survey taken in April 1985, the following types of firms and organizations were authorized to accept food stamps. More than 98 percent of the outlets were retail food stores.

Type of establishment	Number	Percent of total
Retail food stores	230,344	98.22
Wholesale food dealers[1]	311	0.13
Meals on wheels	1,190	0.51
Communal dining[2]	1,694	0.72
Alcohol/drug treatment centers	615	0.26
Private restaurants[3]	352	0.15
Group living facilities[4]	20	.01
Total	234,526	100.00

[1]Under certain conditions, wholesalers servicing retailers or alcohol and drug treatment centers can be authorized to receive food stamps. [2]Primarily elderly feeding programs where food stamps can be accepted. [3]Organizations authorized to provide reduced-price meals to the elderly or needy.

1984. Participation by women and infants rose by 8 percent, while the number of children (ages 1 to 5 years) participating increased 7 percent. WIC monthly benefits averaged $31.86 per person, about 50 cents higher than a year earlier. Food costs totaled $317.0 million, up from $289.8 million in 1984. Total costs rose from $363 million to $394 million.

The target population for the Commodity Supplemental Food Program (CSFP) is similar to WIC, except CSFP extends participation for children up to age 6. The two programs may operate in the same locality, but a person may not participate in both. CSFP operates 28 projects in 13 States and the District of Columbia. Average participation increased slightly from 139,000 to 140,400. About 65.3 percent of the participants were children, 19.5 percent were women, and 15.2 percent were infants.

The total value of commodities distributed to CSFP participants fell from $9.7 million to $8.6 million because of a $1.3-million reduction in bonus commodities. Average monthly benefits per person declined from $23.27 to $20.43. Participants receive juice, hot cereal, nonfat dry milk, egg mix, canned fruits and vegetables, canned meat and poultry, cheese, and infant formula.

An average of 19,338 persons participated in the Elderly Feeding Pilot Projects in the fourth quarter of 1985, a small increase from the 19,313 persons served in 1984. These projects are operated under the auspices of the CSFP in Des Moines, Detroit, and New Orleans. Low-income elderly participants receive foods similar to those distributed under the CSFP program. Monthly benefits per person averaged $8.95, a 14- percent decrease from $10.45 in 1984. Food costs totaled $519,221, down from $605,947 in 1984.

Food Donation Programs

USDA donates food through the Food Distribution Program on Indian Reservations to assist low-income households on or near the reservations and in the Trust Territories of the Pacific Islands. Average program participation during the comparison period rose from 131,736 to 139,217. Food costs (including bonus commodities) totaled $12.2 million, up from $11.8 million in 1984.

The Nutrition Program for the Elderly is administered by the Department of Health and Human Services, although it receives USDA-donated food or cash-in-lieu of commodities. Approximately 55.9 million meals were served under this program in the fourth quarter of 1985, a 3.6-percent increase from 1984. Total USDA expenditures for the program rose from $28.2 million to $35.7 million, a 26-percent increase from 1984.

Food costs for the Temporary Emergency Food Assistance Program declined from $271.6 million to $205.7 million in 1985. Under this program, USDA donates surplus cheese, butter, nonfat dry milk, honey, rice, flour, and cornmeal to the needy. □

Table 1. Federal Cost of USDA Food Programs[1]

Program	1983	1984	1985[2]	1984 (Quarters)[3] I	II	III	IV	1985[2 3] I	II	III	IV
				Million dollars							
Family food											
Food Stamps	11,119	10,675	10,705	2,769	2,668	2,534	2,703	2,771	2,694	2,582	2,658
Nutr. Asst. Prog. in Puerto Rico	825	825	825	206	206	206	206	206	206	206	206
Food distribution											
Food distribution on Indian Reservations	36	43	48	10	10	12	12	12	12	12	12
Schools[4]	819	826	850	274	161	148	243	270	157	148	275
Other[5]	229	226	201	66	61	44	55	48	59	52	42
Temporary Emergency Assistance	1,130	1,059	914	269	269	249	272	265	254	189	206
Cash in lieu of commodities[6]	126	133	142	36	30	36	31	36	35	35	36
Child nutrition[7]											
School Lunch	2,443	2,552	2,611	827	606	318	801	807	644	327	833
School Breakfast	357	378	393	119	91	50	119	117	99	51	126
Child Care Food and Summer Food Serv. Prog.	407	454	498	93	107	155	98	101	119	171	107
Special Milk	17	16	16	5	4	4	4	4	4	4	4
WIC[8]	1,194	1,417	1,524	349	351	354	363	368	375	387	394
Total[9]	18,702	18,604	18,727	5,023	4,564	4,110	4,907	5,005	4,658	4,165	4,899

[1]Calendar years. Administrative costs are excluded unless noted. [2]Preliminary. [3]Quarterly data may not add to annual total because of rounding. [4]National School Lunch, Child Care Food, Summer Food Service programs, and commodity schools. [5]Commodity Supplemental Food Program, Elderly Feeding Pilot Project, Nutrition Program for the Elderly, and donations to charitable institutions. [6]Child nutrition programs and the Nutrition Program for the Elderly. [7]Cash expenditures. [8]Special Supplemental Food Program for Women, Infants, and Children. Includes administrative costs. [9]Program data may not add to totals because of rounding.

Source: Compiled from monthly data from the Food and Nutrition Service, USDA.

New Legislation Brings Changes in Food Assistance

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The Food Security Act of 1985, popularly known as the 1985 farm bill, contains a number of provisions that affect Federal food assistance programs. The Act continues the Food Stamp Program (FSP) through September 30, 1990, increases the funding for Puerto Rico's Nutritional Assistance Program, and reauthorizes the Temporary Emergency Food Assistance Program for 2 years.

Changes prescribed by the Act are expected to boost costs for these and several other food programs by around 2 percent, or $1 billion above projected costs, had the expiring legislation been extended without change for another 5 years. Economic Research Service (ERS) estimates indicate that roughly $850 million of the increased costs between 1985 and 1990 will result from changes in two programs—the Food Stamp Program and the Nutritional Assistance Program in Puerto Rico.

Changes Affecting Food Stamp Eligibility and Benefits

Many of the provisions of Title XV of the Food Security Act are designed to increase benefits and encourage expanded participation in the FSP. Under the new law, for example, residents of publicly operated mental health centers are eligible for food stamps. Households in which all members receive payments under the Aid to Families with Dependent Children Program or the Supplemental Security Income Program (SSI) are automatically eligible to receive food stamps. In determining eligibility for the FSP, the definition of disabled persons is also expanded to include disabled veterans, selected retirees receiving public assistance, and recipients of State SSI aid to the blind and disabled. Households with disabled members are permitted a medical care deduction and an unlimited excess shelter-cost deduction in meeting income qualification requirements.

Up to 200,000 more households are able to participate in the FSP because of the increased limit on allowable financial resources. The asset limit for nonelderly households was increased on May 1 from $1,500 to $2,000. Assets include cash and resources that can easily be converted to cash, such as checking and savings accounts, stocks, and bonds. The asset limit for single elderly households was raised from $1,500 to $3,000. Under previous legislation, the $3,000 limit only applied to households of two or more persons, when at least one was 60 or older.

The Food Security Act of 1985 has a number of provisions that affect the Food Stamp Program.

Eligibility for the FSP is also expanded through changes in the deductions allowed from gross monthly income. To participate in the program, households must meet gross (except households with elderly and disabled members) and net income standards. The net income figure is determined by subtracting allowable deductions.

The earned income deduction is designed to compensate households for mandatory work-related expenses, such as taxes and union dues. Effective May 1, 1986, the deduction rose from 18 to 20 percent of earned income.

Separate deductions are allowed for actual dependent care and shelter costs in excess of 50 percent of the household's gross income. The maximum deduction for dependent care is $160 a month, with no adjustments for inflation or geographic location. The maximum excess shelter deduction is $147 a month in the 48 contiguous States and the District of Columbia. Previously, the maximum monthly combined dependent care and excess shelter cost deduction was $139.

The new definition of countable household income excludes the portion of an education grant, loan, or other educational assistance that is used to pay tuition and mandatory fees at a post-secondary educational institution. Educational loan origination fees and insurance premiums are also excluded when determining whether FSP income eligibility standards are met.

Farmers are entitled to subtract the losses incurred from self-employment from their countable income from outside jobs. Earnings from on-the-job training programs under the Job Training Partnership Act are counted as earned income, except for dependents under age 19.

The Food Security Act has new disqualification procedures for households and individuals. If a household head fails to meet certain work requirements, then the entire household is disqualified from receiving food stamps. However, if any member other than the household head does not comply with the work requirements, then only that person is barred from the FSP. Previously, failure of any household member to comply with the work requirements would have disqualified the entire household for 2 months.

Household heads between 16 and 18 years of age will no longer be automatically exempt from the work requirements. These persons must comply with the requirements if they are not attending school at least half-time or participating in an employment training program. Previously, the rule did not apply to persons under age 18.

Changes Affecting FSP Program Administration

The Food Security Act also addresses problems of error and fraud and establishes several pilot projects. The Act, for example, mandates verification of household income and household size, where questionable, and permits States to require verification of other information used in determining eligibility. If, because of error or fraud, participants receive more benefits

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than they are entitled to, States may collect the value of the excess payment through unemployment compensation agencies. Each adult member of a food stamp household will be held liable for repaying the value of the excess food stamps.

To prevent misuse of the stamps, the Secretary of Agriculture may require States to use photographic identification cards, if they are cost effective. States may allow households to use photo identification cards issued under other public assistance programs.

The Secretary may allow States to test simplified applications for food stamps and standardized benefits in five statewide and five local sites. States may also stagger issuance of food stamp benefits throughout the entire month as long as no household goes longer than 40 days without them. This provision is designed to distribute the workload of local issuance offices throughout the month.

The existing pilot projects that provide cash rather than food coupons to households composed entirely of persons 65 or older or those eligible for Supplemental Security Income may continue through September 30, 1990, at the request of the States.

Provisions Affecting Other Food Programs

In a major program change, States may operate the Food Stamp and Commodity Distribution programs in the same area. This was not allowed under previous legislation, except to victims of natural disasters or to participants in the Commodity Supplemental Food Program, the Food Distribution Program on Indian Reservations, or the Temporary Emergency Food Assistance Program.

Table 1. Food Security Act of 1985 Brings Changes in FSP and Other Programs

	Old Law	New Law
Food Stamp Program		
Program funding	Temporary legislation which continued FSP through fiscal 1985.	FSP is extended through fiscal 1990 at higher authorization levels.
Countable income		Grants, loans, etc. used for tuition and mandatory fees are excluded.
		Farmers can deduct self-employment losses.
Deductions from income		
Earned income	18 percent of earned income.	20 percent of earned income.
Dependent care and shelter costs	Together could not exceed $139 a month.	Treated separately. Maximum for dependent care is $160 per month; shelter costs, $147.
Asset limitations		
Nonelderly households	$1,500.	$2,000.
Elderly households	$1,500 for household with one elderly person; $3,000 for two or more.	$3,000 for households with one or more elderly.
Eligibility disqualifications	Failure of any household member to comply with work for 2 months.	If household head fails to meet work require other member, only he or she is disqualified.
Employment and training	None.	States required to implement program by April 1, 1987.
Sales tax on food	Sales tax collected on food bought with stamps.	States taxing food stamp purchases will be prohibited from participating in program.
Puerto Rico Nutrition Assistance Program	Grant set at $825 million annually.	Authorizes funding at $825 million in fiscal 1986, rising to $937 million by fiscal 1990.
Temporary Emergency Food Assistance Program	Program expired in fiscal year 1985.	Extended program through September 30, 1987.

The Act reauthorizes the Secretary to purchase and distribute commodities for these programs and for the Food Distribution Program in the Trust Territory of the Pacific Islands, summer camps, charitable institutions, and declared disaster areas. Dairy products, wheat or wheat products, rice, honey, and corn meal will be distributed at no cost and not charged against program entitlements if they are available in Commodity Credit Corporation inventories.

To provide nutrition assistance to the needy, nonprofit organizations, such as schools receiving commodities under Section 32 of the Act of August 24, 1935, can transfer their commodities to other nonprofit organizations that can use them without waste or cost. School districts that participated in the pilot project study of cash-in-lieu of commodities and commodity letter of credit under the National School Lunch Program are allowed to continue receiving one of these alternative forms of assistance through June 30, 1987.

States must encourage FSP participants to join the Expanded Food and Nutrition Education Program (EFNEP). State agencies should allow EFNEP officials, where practicable, to display information about EFNEP in food stamp offices.

The Secretary is directed to include a representative sample of low-income persons in the Department of Agriculture's continuing survey of food intake, the Household Food Consumption Survey, and Nationwide Food Consumption Survey. Data are to be collected on food purchases and other household expenditures by low-income persons.

Program Costs Could Rise

To determine the comparative cost of the new bill, ERS researchers developed baseline estimates of program expenditures for 1986-90 under the expiring legislation. The estimates were derived by using forecasts of USDA's Thrifty Food Plan (TFP) and Congressional Budget Office projections of the major economic indicators. (The TFP, the least costly of USDA's four food plans, is used with household income to calculate program benefits for a particular household size.) The baseline estimates were then compared with new spending levels authorized by the 1985 Act, which range from $13.04 billion in fiscal year 1986 to $15.97 billion in 1990.

Provisions of the 1985 Act increase the eligibility limit for assets and income deductions for work-related expenses. Shelter and dependent care costs are expected to boost FSP costs the most. Expenditures could increase more than $600 million dollars above the baseline over the 5-year period as participation increases and benefits to households already in the program rise.

An increase in the block grant for Puerto Rico's Nutrition Assistance Program, to $936 million by 1990, is intended to adjust benefits for expected food price inflation. Operated separately from the FSP since July 1982, the program has been funded at a constant level of $825 million. The increase for the Nutritional Assistance Program will add approximately $250 million above the baseline.

Another added Federal cost of as much as $100 million annually may come in response to a provision requiring States to implement employment and training programs by April 1, 1987. The Federal Government will assume 50 percent of the administrative costs associated with these programs, which will assist food stamp participants in obtaining skills, training, and experience to increase their chances of employment. If the programs are successful, however, the reduction in FSP participation may offer savings that nearly match the added administrative costs.

The reauthorization of the Temporary Emergency Food Assistance Program for 2 years will cost the Federal Government $100 million for 1986 and 1987. Program funds will be used to assist States in meeting the costs of distributing approximately $1 billion worth of surplus commodities each year. Beginning January 1, 1987, States are required to match Federal funds on a dollar-for-dollar basis.

Not all provisions of the 1985 Act will increase food program costs. Some savings will result from a provision to include Job Training Partnership Act earnings as part of income in determining eligibility for the FSP. This could reduce program costs over the next 5 years by $150 to $200 million.

The Food Security Act specifies that, after fiscal 1987, States can no longer impose sales tax on FSP purchases. Although there is no direct Federal cost involved in this provision, the amendment effectively increases benefits to FSP recipients in 17 States who presently pay about $100 million a year in sales tax on food. □

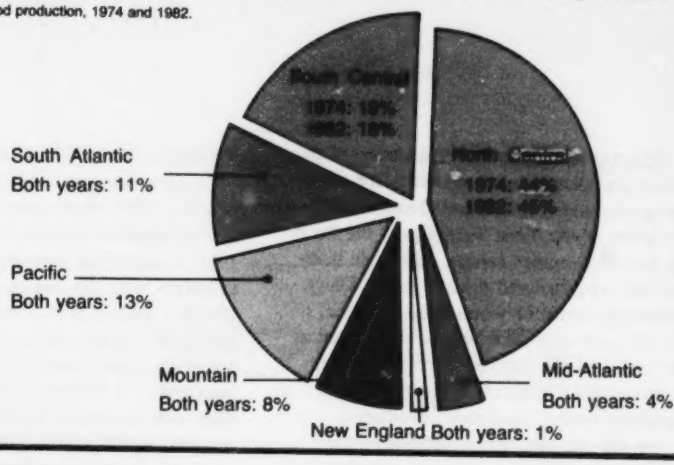
Changing Participants in U.S. Food Production and Consumption

U.S. Food Production

The North Central States produce the largest portion of America's food output—about 45 percent of the U.S. total in 1974 and 1982. Other large producers are the South Central States and the Pacific region. New England, with only 1 percent, is the smallest food producer.

North Central States Are America's Bread (and Corn, Milk, and Pork) Basket

Percent of U.S. food production, 1974 and 1982.

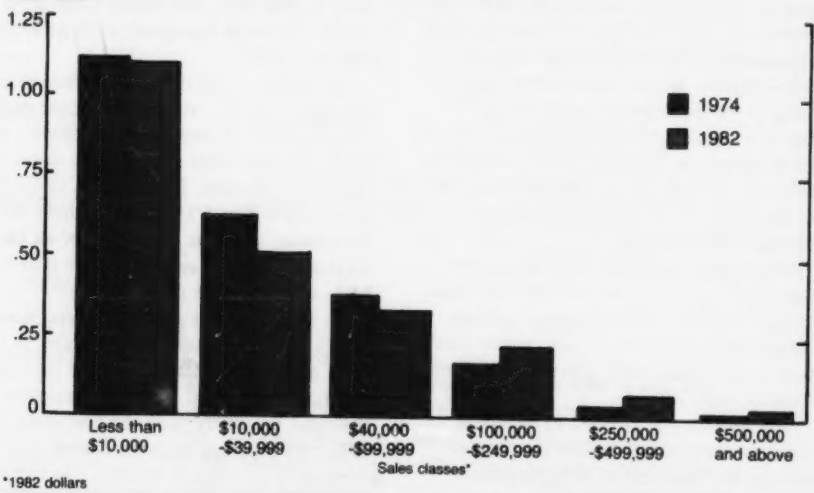


U.S. Farms by Sales Class

The distribution of farms by sales class shifted away from mid-sized commercial farms between 1974 and 1982. Measured in terms of the real (inflation-adjusted) value of farm products, "family farms" with sales between $10,000 and $99,999 decreased considerably, while those with sales exceeding $100,000 increased. Very small farms, with those less than $10,000 in farm product sales, remained fairly constant.

Farms in Larger Sales Classes Have Grown Rapidly

Million farms

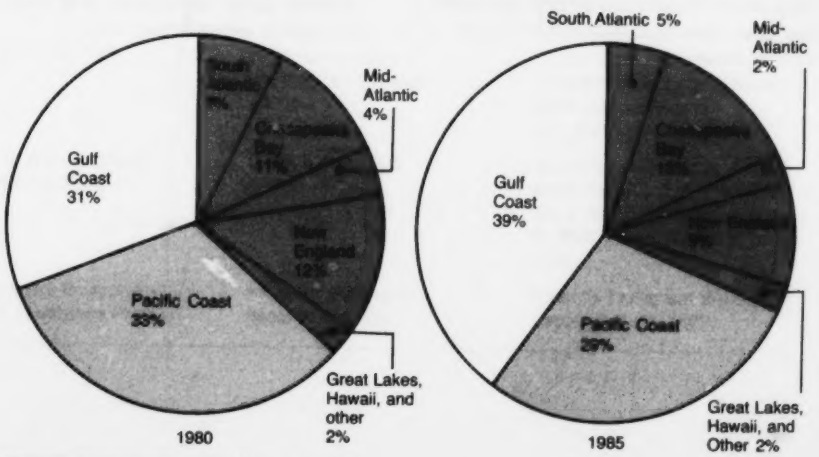


*1982 dollars

U.S. Fish Catch

The Gulf and Pacific Coasts account for the lion's share of the U.S. fish catch. However, between 1980 and 1985, the Pacific Coast's share decreased slightly, and the Gulf's share climbed 8 percentage points. The Chesapeake Bay and New England were also large contributors to the U.S. catch.

Gulf Coast's Share Gains While Pacific Coast's Declines*

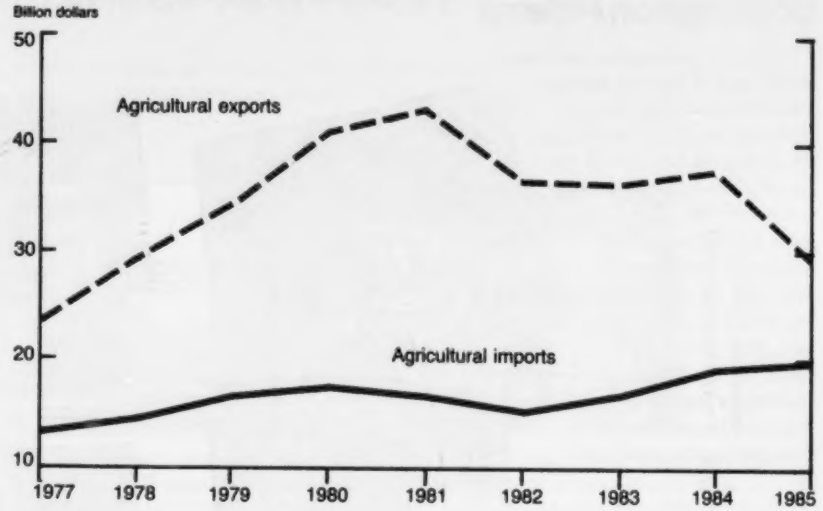


*Components may not add to 100% because of rounding.

U.S. Agricultural Trade

While U.S. agricultural trade continues clearly in surplus, imports have been closing the gap with exports since 1981. Data for 1985 show imports and exports the closest they've been since the early 1970's. However, the long-term outlook is better because some factors behind the worsening trade balance have improved. The U.S. dollar is down from its February 1985 peak; new farm legislation is expected to improve the U.S. market share of farm exports; and lower oil prices and interest rates will help purchases by developing nations.

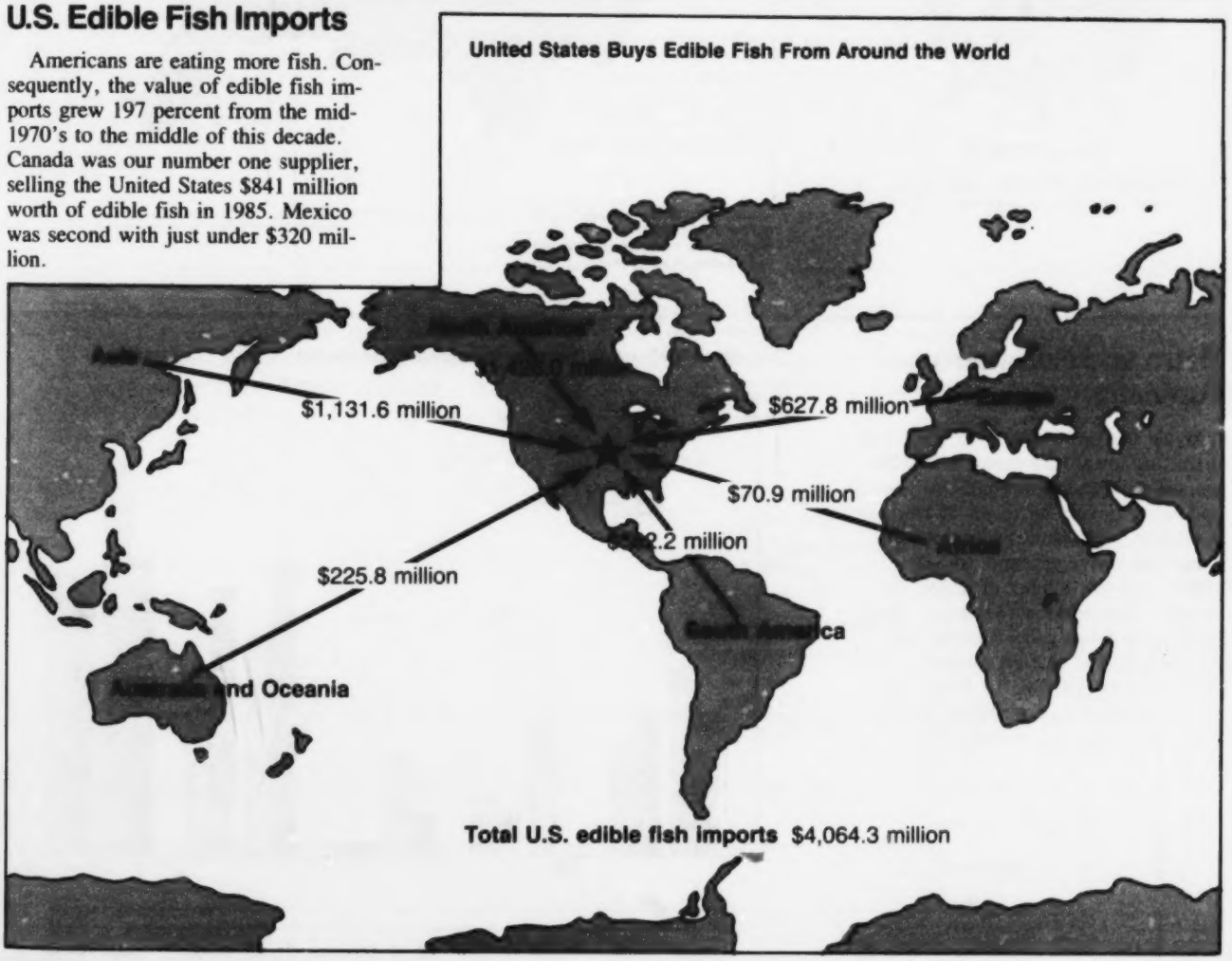
U.S. Agricultural Imports Narrow the Gap with Exports



U.S. Edible Fish Imports

Americans are eating more fish. Consequently, the value of edible fish imports grew 197 percent from the mid-1970's to the middle of this decade. Canada was our number one supplier, selling the United States $841 million worth of edible fish in 1985. Mexico was second with just under $320 million.

United States Buys Edible Fish From Around the World



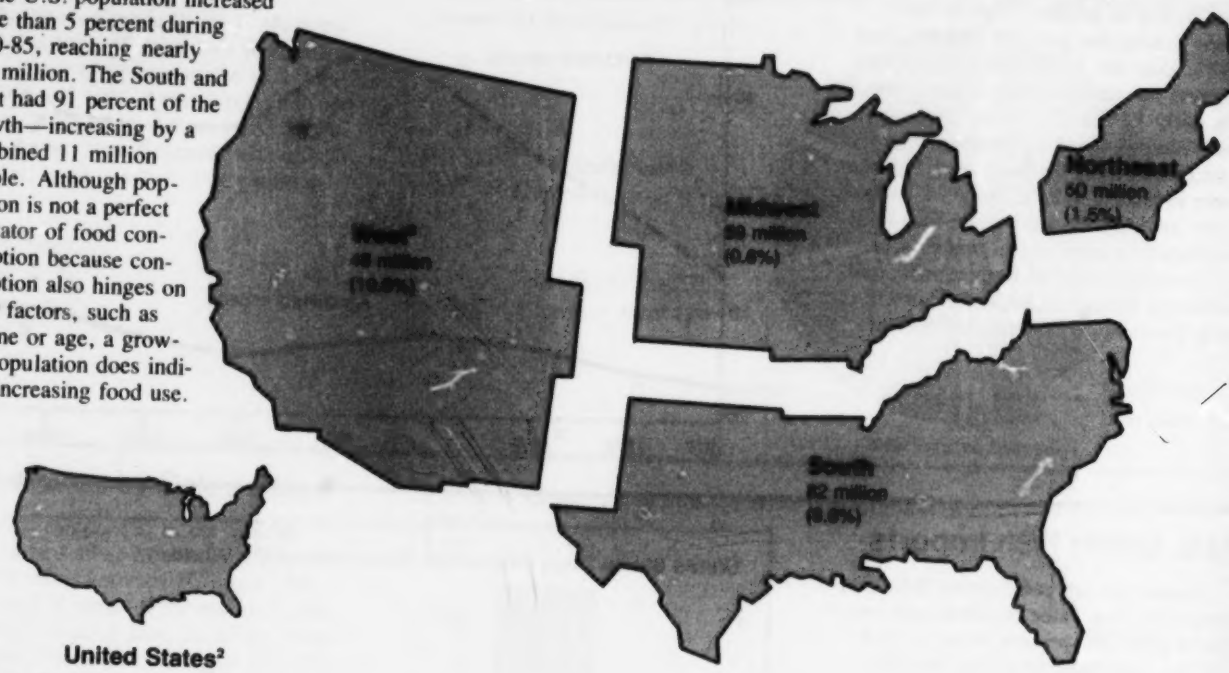
*Includes fish imports from Canada, Mexico, Central America, and the Caribbean.

Source: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, *Fisheries of the United States, 1985.*

Population and Consumption Patterns

The U.S. population increased more than 5 percent during 1980-85, reaching nearly 239 million. The South and West had 91 percent of the growth—increasing by a combined 11 million people. Although population is not a perfect indicator of food consumption because consumption also hinges on other factors, such as income or age, a growing population does indicate increasing food use.

South Had the Largest Population in 1985, but West Saw the Greatest Growth[1]

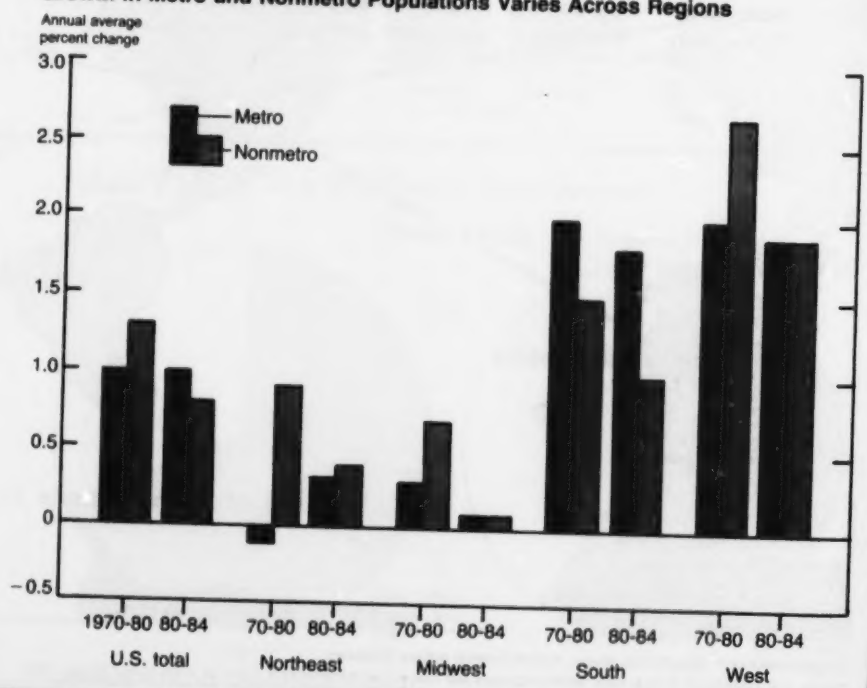


[1] Estimated population as of July 1, 1985. Percent change from 1980 to 1985. Totals include Armed Forces residing in each State.
[2] West and U.S. totals include Alaska and Hawaii.
Source: Bureau of the Census.

Metro and Nonmetro Population

While the United States on the whole is shifting toward the metro areas, the proportion of metro to nonmetro population varies greatly by region. In the Northeast, both metro and nonmetro populations have grown during the 1980's, but the number of people in nonmetro areas has grown faster. Meanwhile, population growth in the Midwest has slowed in both categories. Ever since the 1970's, the South has seen a tremendous push in metro population, while nonmetro population growth in the West has fallen back to the metro level so far this decade.

Growth in Metro and Nonmetro Populations Varies Across Regions



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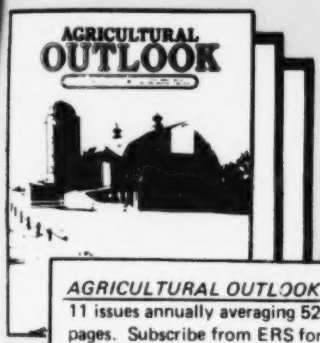

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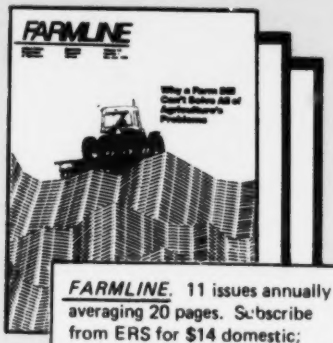

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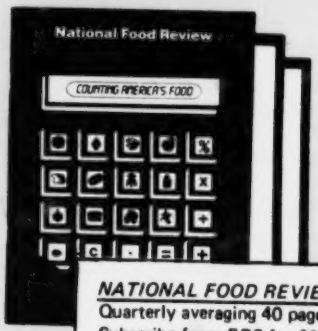

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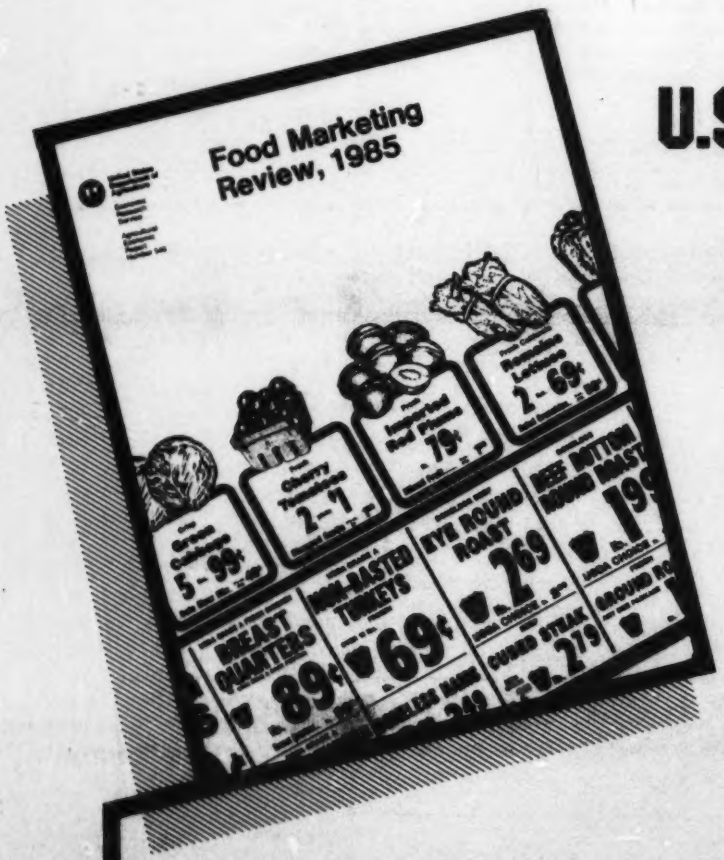

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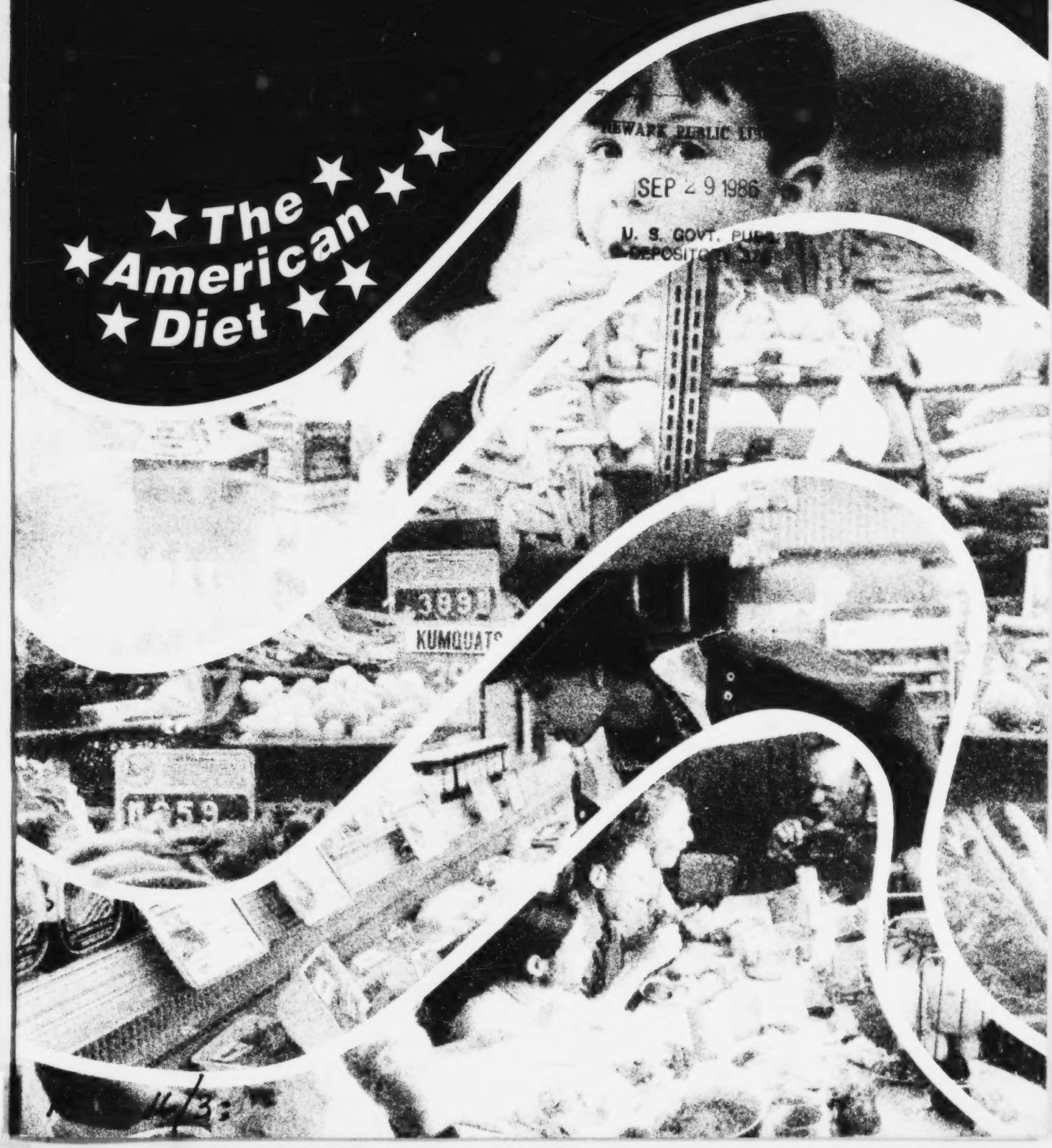

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Grain Products Regain Popularity

Karen Bunch and Bruce Wendland
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Grain is called the "staff of life," but it seemed for a while that Americans were getting along with less of it. However, the trend is changing.

After declining dramatically from the early 1900's, to a low of about 137 pounds per capita in 1972, consumption of grain products increased 9 percent by 1985 *(figure 1)*. Current consumption of food grains is approximately 150 pounds per person per year, similar to levels during the 1950's.

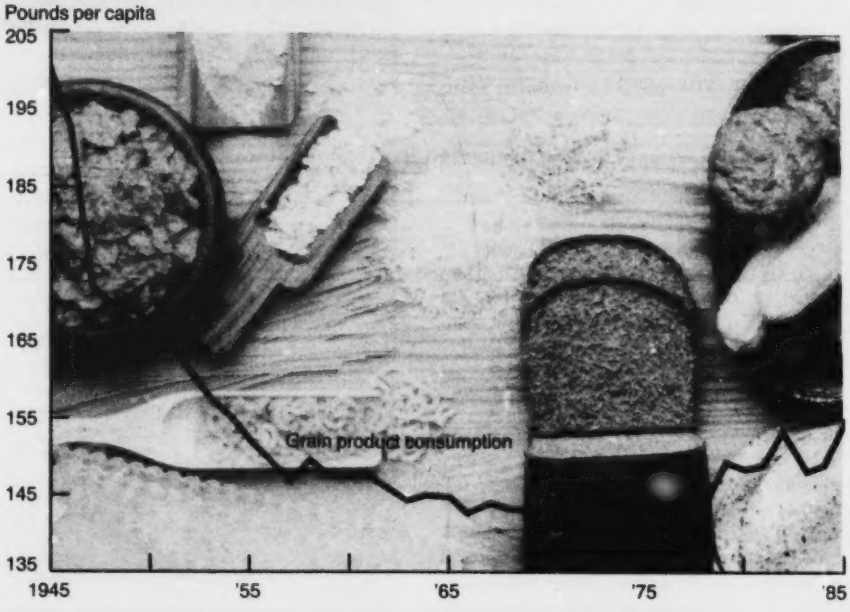
As a percentage of the food budget, U.S. households increased their expenditures on cereal and grain products from 12.1 percent during 1972-73 to 12.7 percent during 1980-81. The only other gainers were fruits, sweeteners, and specialty foods and beverages.

Many factors have led consumers to eat more grain products. Recommendations from many health groups, including the American Heart Association and the National Cancer Institute, have encouraged Americans to reduce their fat consumption and increase use of the complex carbohydrates found in grain products.

Another major influence on the shift to grain products is the increasing demand for variety in the diet. Furthermore, rising incomes mean that consumers spend more on prepared foods and foods away from home. Manufacturers have responded to these influences by introducing grain-based foods that are new to the American diet—like croissants. In addition, some old favorites, such as pasta and rice, have achieved new popularity.

Perhaps as part of the quest for variety, Americans seem more willing to experiment with different cuisines, such as Italian, Mexican, and Chinese. These cuisines generally include more grain products than the standard American fare of meat and potatoes.

Figure 1. Grain Product Consumption Has Increased Since the Early 1970's



A recent survey of eating patterns provides further evidence that Americans are using more grain products. USDA's Continuing Survey of Food Intake by Individuals measured the food eaten by women 19-50 years of age and their children under 5 years old for 1 day in 1985 *(for more information on survey, see articles on women's diets and calcium in this issue)*. The women surveyed ate 29 percent more grain products in 1985 than their counterparts in 1977, the last year in which a similar survey was taken. This gain was primarily due to a 79-percent increase in consumption of grain mixtures. Grain mixtures are entrees that may or may not include a small amount of meat, such as pizza or enchiladas. Grain consumption by children under 5 in 1985 was up 18 percent from 1977, primarily because of increases in breakfast cereals and grain mixtures.

Wheat Flour and Products Show Major Gains

Wheat is the major grain product eaten in the United States, with wheat flour and other products representing more than 80 percent of total grain consumption. In 1984, 163 pounds of wheat per person (grain equivalent) were used in manufactured food products *(for background on data, see sidebar box)*.

Flour has been one of the major gainers in recent years. In 1985, 122.5 pounds of wheat flour were produced for every American, up 12 percent from the low point in 1972 and the highest in more than 30 years *(table 1)*. Only about 15 percent is sold directly to consumers, 10 percent as flour and 5 percent in prepared mixes, such

The authors are agricultural economists in the Food Marketing and Consumption Economics Branch and Crops Branch, respectively, of the National Economics Division.

as cake mixes. The remainder is further processed into baked goods, pasta, and many other foods.

Consumption trends reflect growing concerns about health and demand for variety. Nowhere are these issues more clearly seen than in the case of bread. Total per capita bread consumption declined 22 percent after 1967, to about 46.4 pounds by 1985 *(figure 2)*. All of the decrease was in white pan bread, which fell more than 39 percent since 1967. At the same time, consumption of whole grain and variety breads (for example, rye, pumpernickel, French, and Italian) increased 12 percent and represented about 40 percent of total bread consumption last year. Whole wheat bread alone doubled after 1967, but at almost 9 pounds per person in 1985, it was still less than half the consumption of white bread.

Table 1. 1985 Wheat Flour Consumption the Highest Since the Late 1950's

	Wheat flour	Rye flour	Rice	Corn flour and meal
		Pounds per person		
1910-14	211.0	3.8	6.9	47.9
1915-19	194.6	3.3	8.8	44.2
1920-24	177.1	2.8	5.6	34.8
1925-29	179.8	2.8	5.6	29.5
1930-34	165.2	2.7	5.3	26.5
1935-39	159.5	2.3	5.8	23.1
1940-44	155.9	2.6	5.6	20.4
1945-49	145.7	1.7	4.7	14.3
1950-54	130.6	1.5	5.4	10.4
1955-59	120.8	1.3	5.5	7.9
1960-64	116.1	1.1	6.7	5.9
1965	113.3	1.2	7.6	6.8
1966	112.0	1.2	7.3	7.5
1967	113.0	1.2	7.5	7.7
1968	112.8	1.3	7.9	7.4
1969	112.5	1.2	8.3	7.5
1970	110.8	1.2	6.7	7.0
1971	110.5	1.1	7.6	6.7
1972	109.8	1.0	7.0	6.2
1973	112.8	1.3	7.0	5.9
1974	110.9	1.2	7.5	5.8
1975	114.5	1.0	7.6	6.0
1976	119.1	0.8	7.1	5.8
1977	115.5	0.8	7.5	5.7
1978	115.2	0.8	5.7	5.9
1979	117.2	0.7	9.4	6.2
1980	116.9	0.7	9.4	6.3
1981	115.9	0.7	11.0	6.2
1982	119.6	0.6	11.8	6.6
1983	116.1	0.7	9.8	6.6
1984	117.8	0.8	8.5	6.6
1985	122.5	0.8	9.3	6.8

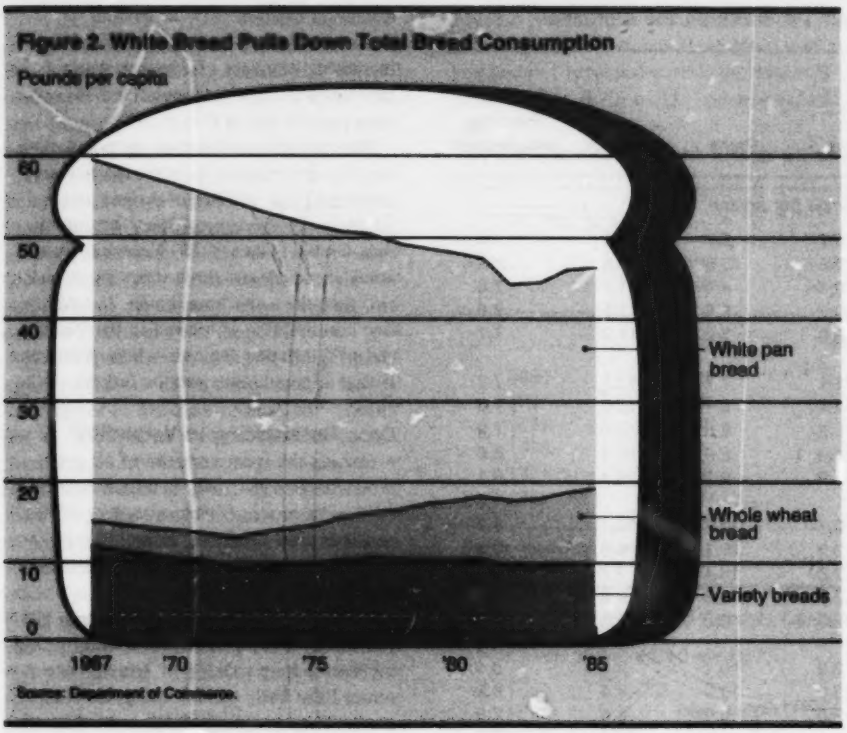
Nutrition and variety in the diet contributed to the switch to whole grain and other breads. A 1983 survey by the Wheat Industry Council found that many people believed that white bread was high in preservatives and low in nutritional value. They also thought of it as more suitable for children, which may partly explain the decline in consumption, since the number of children has decreased since 1972. On the other hand, consumers perceived wheat bread to be higher in fiber and vitamins and lower in calories than white bread. They also considered it to be a better value than white bread.

White bread also has not been popular in the away-from-home market. A 1980 study by food manufacturer Rich Products, Inc. found that white bread was the favorite lunch bread of only 9 percent of those surveyed. French, Italian, and whole grain breads were preferred by 67 percent of the survey respondents.

Sales of rolls increased 50 percent in 15 years, rising to almost 20 pounds per person in 1982, fueled by fast food sales of hamburger and hotdog buns. However, consumption of these buns has declined slightly in recent years, partly because of the introduction of fast food items that do not include bread, such as chicken, salads, and baked potatoes.

Declines in hamburger and hotdog buns have been more than offset by increases in other types of bread products. Kaiser and other variety rolls, bagels, and English muffins increased from 1.8 pounds per person in 1967 to 4.7 in 1982. English muffin sales alone doubled between 1972 and 1982, partly because of fast food breakfast sandwiches.

The cookie and cracker industries used over 3 billion pounds of flour in 1982,



roughly 13 pounds per person. Nineteen pounds of cookies and crackers were produced for each person in 1985 *(table 2)*. Cracker consumption rose 21 percent between 1967 and 1977, but declined about 13 percent by 1985, to 8 pounds per person. Meanwhile, cookie consumption, which declined 18 percent between 1967 and 1982, was revitalized in 1983 by the introduction of soft store-bought cookies. Consumption jumped 6 percent in 1984 and another 5 percent to 11 pounds per person in 1985. Last year, the dollar value of supermarket sales of cookies rose 14 percent.

Sales Expand in Retail Bakeries

Another reason for the rising use of grain products is an increase in retail bakery sales. In 1982, the last year of the retail census, these bakeries took in $6.2 billion, an additional 35 percent above sales by manufacturers.

Among retail bakeries, tremendous growth has occurred in the number and sales of those in supermarkets. Surveys by the bakery and supermarket industries indicate that the number of in-store bakeries has more than doubled since 1980, with sales topping the $4 billion mark in 1985.

In-store bakeries appeal to customers because of the convenience and freshness of the products. Smaller households can buy just the amount they need, rather than relying on packaged products designed for larger families.

Bread and rolls accounted for about 39 percent of in-store sales in 1984; doughnuts, 16 percent; cakes, 11 percent; and pies, cookies, bagels, croissants, and other sweet baked goods, 34 percent.

About 50 percent of in-store bakeries rely on frozen dough that is produced elsewhere and baked in the store, particularly for labor-intensive items such as croissants. Frozen bakery products sold directly to consumers have also become more popular. For example, The Kitchens of Sara Lee increased sales 25 percent in 1985.

Pasta Sheds Its Dull Image

One of the largest gainers among flour products is pasta. Macaroni, spaghetti, and noodles are made primarily from durum wheat, a very hard wheat that is somewhat higher in protein than other varieties. In 1982, more than 1.5 billion pounds of durum flour were made into pasta products. An additional 159 million pounds of pasta were imported. Last year, each American ate more than 12 pounds of pasta, up more than 30 percent from 1970 *(table 2)*.

Pasta consumption has increased in part because these products fit into changing lifestyles, having shed their dull image in the process. As recently as 1983, respondents to the Wheat Industry Council's survey described pasta as "inexpensive, filling, and fattening." While dishes such as macaroni and cheese may still fit this description, other products, like pasta primavera—pasta and vegetables—help consumers see a different image.

While grocery store sales of pasta have increased modestly, it's the away-from-home market that has made the biggest gains. Pasta dishes in restaurants are now often considered a "light" alternative to more traditional entrees. The popularity of ethnic foods has also boosted pasta consumption. A recent survey by a restaurant magazine found that Italian food represents 40 percent of all ethnic meals ordered in restaurants.

Pasta salads have also moved into the spotlight. Instead of just serving macaroni salad as a side dish with a sandwich, restaurants are featuring a variety of pasta salads as entrees. In 1984, 45 percent of restaurants offered pasta salads.

Rice Gains Popularity

Rice is another major grain product to show significant consumption gains. Use of rice has increased about 39 percent since the 1970's 20-year low of 6.7 pounds per capita. Average consumption from 1980

Table 2. Consumption of Manufactured Grain Products on the Increase

	Breakfast cereals[1]					
	Ready to eat	Ready to cook	Total	Pasta	Cookies	Crackers and pretzels
			Pounds per person			
1965	7.6	3.1	10.7	5.7	NA	NA
1966	8.0	2.6	10.6	5.6	NA	NA
1967	8.3	2.1	10.4	6.4	11.7	7.6
1968	8.5	2.2	10.7	6.8	11.5	7.6
1969	8.6	2.3	10.9	7.2	11.3	7.7
1970	8.7	2.4	11.1	7.7	11.1	7.7
1971	8.9	2.5	11.4	8.1	10.9	7.8
1972	8.7	2.6	11.3	8.6	10.8	7.9
1973	8.9	2.7	11.6	9.0	10.6	8.0
1974	9.1	2.8	11.9	9.3	10.4	8.1
1975	9.3	2.8	12.1	9.7	10.1	8.4
1976	9.6	2.9	12.5	10.1	9.9	8.8
1977	9.8	3.0	12.8	10.4	9.7	9.2
1978	9.8	3.0	12.8	10.3	9.6	8.9
1979	9.9	2.9	12.8	10.2	9.6	8.6
1980	10.0	2.9	12.9	10.1	9.5	8.4
1981	10.1	2.9	13.0	10.0	9.4	8.2
1982	10.1	2.9	13.0	9.9	9.6	7.9
1983	10.2	2.9	13.1	10.5	9.9	7.8
1984	10.3	3.0	13.3	11.2	10.5[2]	7.9
1985	10.6	3.1	13.7	12.3	11.0[2]	8.0

[1]Includes infant cereals. [2]Estimated.

to 1985 was about 10 pounds, the highest since the 1920's.

About 60 to 65 percent of rice is sold for direct consumption, a relatively constant percentage since the mid-1950's. The next major use is in beer—29 percent of the total in 1982. However, USDA figures for rice consumption exclude direct shipments to brewers, because alcohol is not considered a food. If use in beer is included, per capita rice consumption would be around 13 pounds over the last few years, compared with 10 pounds for only food. Use of rice in beer has increased more than 70 percent on a per capita basis since the early 1970's, partly because of a 16-percent rise in beer drinking. In addition, one major beer company uses only rice because it produces a lighter-tasting beer.

Rice is also used in processed foods, such as breakfast cereals and soup. In fact, breakfast cereals account for 75 percent of the rice used in processed foods. In 1982, 250 million pounds of rice were processed into breakfast cereals—about 1 pound per person. Soup, baby food, and packaged mixes were the other major processing uses of rice, accounting for another 55 million pounds or 0.2 pound per capita.

Like wheat, rice has benefited from greater variety in the diet and the healthy image of grain products. And similar to pasta, rice has gained in the away-from-home market. In 1982/83, 40 percent of rice was sold in restaurant-sized bags of 25 pounds or more—up from 29 percent in 1971/72. Increasing numbers of ethnic restaurants serving rice, mostly Oriental and Mexican, have contributed to this growth.

The changing makeup of the population has also contributed to increased rice consumption. The number of Asians and Hispanics in the United States has more than doubled since 1970. Nonwhite households spend almost three times as much on rice than do white households. In addition, rice consumption is highest in the Pacific and Mid-Atlantic regions, where Asian and Hispanic populations are the largest.

Corn Outstanding in Versatility

Corn is the most versatile of all grain products. In 1984, over 1 billion bushels of corn were processed into a variety of food and industrial products, including oil, sweeteners, starch, alcohol, animal feed, and flour.

Corn is basically processed through either wet or dry milling. The wet milling process involves a long soaking or seeping step to remove the hull, gluten, and germ components. The remaining starch is used as an end product or further processed into either alcohol or sweeteners. Corn alcohol is used for beverages and for fuel. Sweeteners produced from wet milling include glucose, dextrose, and high fructose corn syrup (HFCS). Use of glucose and dextrose has remained relatively constant over the years. In contrast, use of HFCS has increased faster than almost any other food product, climbing from zero in the late 1960's to over 43 pounds per capita in 1985, mainly in soft drinks.

In the dry milling process, the corn kernel is either ground whole or processed to remove the germ and some of the gluten. This process divides the kernel into two separate products: alcohol and the more familiar corn flour and meal.

Consumption of corn flour and meal is far below the amounts used earlier in the century. Before refrigeration and year-round availability of fresh foods, wheat and corn meal were important staples in the diet.

Corn meal, however, has become significantly less important than wheat flour. At just under 7 pounds per person in 1985, consumption of corn meal has fallen 86 percent from the 1910-14 average. In contrast, wheat flour has dropped only 42 percent.

Consumption of corn products has, however, increased modestly in recent years. The growth in corn cereals, Mexican products, and snack foods has been a boon. Although still way below figures for the early part of the century, corn meal has increased 8 percent from the 1977 low.

Ethnic food growth is led by Mexican-type snack foods and a substantial rise in the number of Mexican restaurants. According to the National Restaurant Association, there were 13,034 Mexican restaurants in the United States in 1985, up 15 percent from 1983. Between 1973 and 1983, sales in Mexican chain restaurants increased at an annual rate of 24 percent—faster than any other type.

Big growth has also occurred in corn snack foods. Sales of corn and tortilla chips increased almost 70 percent between 1980 and 1985 *(table 3)*. In the early 1980's, there was speculation that these products would replace potato chips as the snack food leader. With about 20-percent increases in 1980 and 1981, it looked like this might be true. However, increases have tapered off considerably over the last several years. Sales climbed less than 3 percent to $1.63 billion last year. In contrast, potato chip sales reached more than $2.7 billion. New flavors and thicker, crunchier chips have helped keep potato chips out in front in the snack food race.

Corn is also one of the major grains used in breakfast cereals. Though corn cereals lost some ground in the 1970's, consumption has increased steadily since 1977, reaching 3.3 pounds per person in 1985, double the level of the 1950's.

Breakfast Cereals on the Rise

While consumers reached for more corn cereals in 1985, there were also gains in wheat and mixed grain ready-to-eat cereals. Meanwhile, consumption of ready-to-eat cereals using rice or oats remained constant. The introduction of flavored instant varieties boosted consumption of cooked cereals, primarily oatmeal *(table 2)*. In total, consumption of breakfast cereals increased 22 percent since 1970, to 13.7 pounds in 1985, with presweetened cereals accounting for the largest share of the more than 300 varieties and package sizes *(figure 3)*.

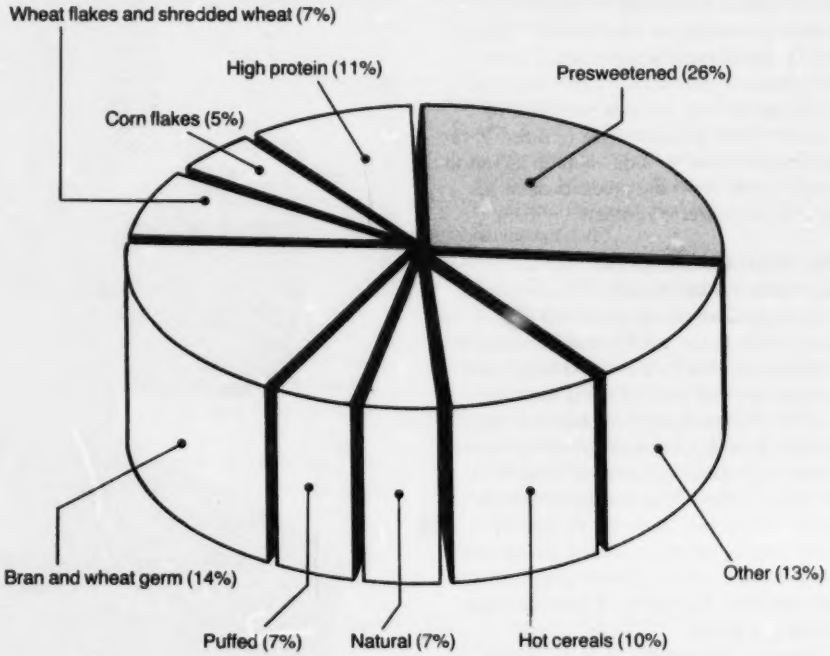
A major factor influencing sales of break-

Table 3. Growth in Corn Snack Sales Has Slowed Since 1980

	Corn snacks		Potato chips	
	Sales (dollars)	Change from previous year	Sales (dollars)	Change from previous year
	Millions	*Percent*	*Millions*	*Percent*
1980	1100	24.6	1900	17.7
1981	1190	19.1	2200	16.3
1982	1330	11.6	2540	14.7
1983	1470	10.8	2690	6.3
1984	1590	8.6	3050	13.4
1985	1630	2.6	3300	8.1

Source: Snack Food Association.

Figure 3. Presweetened Cereals Largest Segment of Breakfast Cereal Sales



Supermarket sales, 1984

[1]Includes cold oats, combination packs of individual servings, and others.
Source: *Progressive Grocer.*

fast cereals is demographic change. Children under 14 years of age eat the most breakfast cereals. However, with fewer children in this age group, manufacturers have turned their attention to designing products for adults.

Nutrition has helped sucessfully market cereals to adults. Companies are now advertising their product as having the most vitamins, the most whole grain, or the least sugar and preservatives. In 1984, Kellogg's kicked off the competition among high-fiber cereals with their ad campaign relating bran cereal to cancer prevention. Kellogg's share of the bran cereal market increased 30 percent in the 48 months following the start of the campaign. With other companies following Kellogg's advertising lead, bran and wheat germ cereals accounted for about 15 percent of ready-to-eat cereals in 1984—up from 12 percent in 1983.

Nutrition and health questions have implications for presweetened cereals. Parental concern about high sugar content of children's cereals influenced the industry to reduce the amount in these products. Sugar use by cereal manufacturers edged down 0.4 percent a year between 1977 and 1982, while use of fruit and nuts increased 16 percent. Some products were renamed to remove sugar from the title—both to appeal to adults and to make the products more acceptable to concerned parents.

Will Grain Consumption Continue To Increase?

Grain product consumption will likely gain further in the years ahead. Demographic changes should be a positive factor. For example, people over 65 spend more on cereals and bakery products than any other age group, and this population group is expected to increase 2.1 percent annually in the next 5 years. This could affect the demand for products currently favored by older people, including cooked cereals and white bread, assuming future seniors adopt the consumption patterns of those currently in that age group.

Similarly, the number of 5- to 19-year olds will increase 0.7 percent by 1990, which may mean a larger market for cookies and breakfast cereals. The Department of Commerce forecasts breakfast cereal consumption up 2.3 percent a year, and cookies 1.7 percent, between now and the end of the decade.

Several major health groups are encouraging people to change their diets, including eating more foods that are high in fiber and complex carbohydrates. If many individuals respond to this advice, long-term growth for grain products could continue.

In hopes of gaining from health awareness, the wheat industry is disseminating nutrition information through their campaign "Eat Wheat, America." Television and radio ads were tested in 14 markets in early 1986, with another 13-week test that began in September. The goal of the campaign is to "improve consumer attitudes toward wheat foods, and convince American mothers that wheat products are good sources of nutrition for the whole family." With the cooperation of bakers and retailers, point-of-purchase materials have been placed in stores and inserts in bread bags encouraging customers to send away for a diet pamphlet from the American Heart As-

Grain products offer consumers the variety they are looking for.

A Closer Look at the Data

This article presents the latest available information on consumption of grain products. Because it was collected from several different sources, however, the latest years reported will vary. For example, the estimates of per capita consumption of rice, and wheat and rye flour were obtained from USDA's data on food supplies and utilization. Estimates were available through 1985.

Data on consumption of manufactured products (bakery products, breakfast cereals, pasta, and corn flour and meal) were derived from the U.S. Department of Commerce's Census of Manufactures, conducted every 5 years. The latest survey covered data for 1982. This information is augmented by annual surveys of a sample of manufacturers.

Beyond the differences in years reported, there are variations in what the data actually measure. USDA's consumption data, for instance, are actually "disappearance" figures because they are derived from estimates of the amount of grain used in food products adjusted for imports, exports, and stock changes. The data, therefore, are not direct estimates of food actually eaten.

The Department of Commerce's estimates of consumption or use of manufactured products reflect the amount produced by manufacturers and sold to consumers through restaurants and food stores. For perishable items, like bread and other bakery products, production is a close approximation of consumption.

Omitted from the Census of Manufactures estimates are products made and sold in bakeries in retail establishments, such as supermarkets. However, while the Census of Manufactures data may understate the total quantity of bakery products consumed, they are indicative of trends in total consumption and shifts among different products.

Finally, adjustments are made in Census of Manufactures data for pasta to account for significant imports and exports of these products. For other bakery and cereal products, trade is negligible.

For more information about data on cereal and bakery products, contact William Janis, Department of Commerce, International Trade Administration, 14th Street and Constitution Avenue, N.W., Washington, D.C. 20230, (202) 377-2550.

sociation. As of May 1, the Wheat Industry Council had received 3,600 requests for the pamphlet.

The baking industry is also working on new ways to improve bread nutritionally. Two areas with greatest potential are calcium fortification and fiber enrichment. Whole wheat bread contains about 6 percent dietary fiber, compared with 2 percent in white bread. Through the addition of fiber, manufacturers could advertise their white bread as having as much fiber as whole wheat. If Kellogg's success in marketing high-fiber cereal is indicative of consumer attitudes, fiber can be used as an effective marketing tool.

The picture also appears bright for pasta. One industry analyst predicts growth of 8.3 percent a year in sales of pasta over the next 10 years. Because of new tariffs on imported pasta, future growth in consumption will likely draw more heavily on domestic supplies.

As for the other grains, rice consumption could increase. The Food Security Act of 1985 substantially lowers the price farmers are paid for their rice relative to other grains. While it's unlikely that this reduction will significantly lower the retail price, it should affect the wholesale price, which may encourage restaurants and institutions to offer more rice dishes on their menus. Food processors should also be enticed to manufacture more processed rice products or include rice in processed entrees.

A larger ethnic population should further increase consumption of rice and corn. The U.S. Census Bureau forecasts that between now and the end of the century, the Hispanic population in the United States will increase 66 percent and the Asian 58 percent, compared with increases of 10 percent for whites and 24 percent for blacks. Though immigrants and their families adopt many American eating patterns, they still maintain preferences for their native cuisines. Their presence also helps introduce other Americans to new tastes and broadens the variety of foods available. □

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Counting the Cost of Restricting Casein Imports

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Casein—the principal protein in milk—is truly a versatile ingredient. It's in a wide array of products, from animal feed and pet foods to imitation cheese, dietary products, and coffee whiteners. It is also used in glues, paints, and cleaning agents.

Despite its widespread use, however, casein is not produced in the United States because producing nonfat dry milk (NFDM) at federally supported prices is more profitable. Nine countries accounted for 92 percent of the 231 million pounds imported by the United States in 1985 *(table 1)*. New Zealand supplied almost half, while seven European countries provided 43 percent, with Ireland supplying about 28 percent of total U.S. imports.

Researchers at USDA's Economic Research Service (ERS) recently examined the impacts of restricting casein imports. The study was conducted in response to a Congressional request to determine whether imports of casein interfere with the Government's dairy price support program.

The ERS report revealed that casein import restrictions would mean lower Federal costs for dairy price supports—from 3 to 14 percent of 1985 program expenditures. Because casein is widely used in consumer and industrial products, however, both manufacturers and consumers would face higher costs. Consumers would also find they had fewer product choices.

The Versatile Ingredient

Casein accounts for roughly 3 percent of the weight of whole milk, and 80 percent of the total protein content. Whole milk is made up of fat, water, and nonfat milk solids. When the fat component of whole milk is skimmed off for making butter, the skim milk that remains includes casein, water, and other nonfat milk solids. This skim milk can be dried and made either into NFDM or casein.

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In the 1940's, only a small percentage of U.S. milk production went for casein, as its use was primarily in industrial products. In 1947, casein production totaled 36 million pounds, but fell to 3 million pounds in 1955, as the price of NFDM rose relative to casein. As a result, NFDM producers diverted milk supplies away from casein. This relative price relationship has continued to keep casein out of production in the United States.

While U.S. production was declining, the uses for casein were expanding worldwide. Developments in cosmetics and textiles in the late 1940's and early 1950's, as well as the introduction of dried casein lactate as a dietary supplement in 1953, marked the beginning of attempts to more fully use its unique characteristics. With growing demand, U.S. imports of casein rose from 21 million pounds in the mid-1940's to 75 million pounds about a decade later.

Water-soluble casein became available in 1955 and, by 1960, it was used in food products around the world. In the 1960's, development of casein's emulsifying and stabilizing qualities facilitated successful introduction of a powdered nondairy coffee whitener. By 1969, as much as one-quarter of the world's estimated annual production of 240 to 320 million pounds went into coffee whiteners and other food. Other major edible uses included medical and dietary products, flavor enhancers, imitation whipped cream for desserts and baked goods, and filler for meat products, such as sausage and luncheon meats.

In the United States during the 1960's, casein was still primarily being used in industrial products, although over 20 million of the 107 million pounds used went into food. These food uses were limited to beverages, breakfast cereals, coffee whiteners, desserts and toppings, and dietetic products.

In the 1970's, U.S. manufacturers discovered even more uses for casein, and it became an important ingredient in baby foods, baked goods, confectionery products, processed meats, dry soups, and pet foods. By 1980, food uses accounted for an estimated 69 percent of the 138.9 million pounds used in the United States *(table 2)*.

Impact of Restricted Imports Depends on Substitutes

To evaluate the impact of restricted imports of casein on the U.S. dairy industry, the ERS researchers identified major domestic casein uses and considered the availability and costs of alternative inputs. The principal alternatives to casein in food and

Casein can be found in a variety of products, from coffee whitener to pizza.

Table 1. New Zealand Supplies Almost Half of U.S. Casein Imports

Country	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
								Million pounds								
New Zealand	63.0	37.9	29.7	31.4	33.5	14.7	56.0	96.3	84.3	92.1	76.8	76.8	85.2	68.4	94.7	102.0
Australia	34.3	31.8	27.3	23.9	18.3	10.0	33.4	23.1	22.9	21.7	17.9	18.4	16.5	18.8	15.3	12.1
Ireland	(²)	.9	4.4	13.6	7.3	5.7	3.3	4.3	9.2	14.8	24.0	19.9	40.2	35.9	39.2	64.9
France	11.2	8.3	8.7	10.3	22.9	5.2	.2	(²)	(²)	2.0	8.9	5.8	14.9	12.0	13.9	10.7
West Germany	.4	2.3	2.6	2.5	5.5	3.5	1.2	.4	.2	.2	.6	1.2	1.2	2.6	1.5	1.9
Netherlands	.2	1.7	4.6	1.8	2.7	2.3	1.1	.6	1.5	2.5	2.5	1.8	4.6	6.0	7.9	7.7
Others	26.2	23.1	28.1	29.3	22.7	17.0	16.9	19.5	19.0	17.5	21.5	3.9	14.2	15.8	19.8	32.1
Total	135.3	106.0	105.4	112.8	112.9	58.4	112.1	144.1	137.1	150.8	152.2	127.8	176.8	159.5	192.3	231.4

¹Includes casein and casein mixtures. ²Less than 100,000 pounds.

Source: U.S. Department of Commerce, Bureau of the Census.

feed include nonfat dry milk, soy products (flour, grits, isolates, and concentrates), and whey protein concentrate. Which of these can be used in various products depends on their technical properties and relative cost.

The main technical substitute for casein in powdered coffee whiteners, for example, is soy protein. Soy-based whiteners are currently marketed for people who must restrict their intake of dairy products. However, these products don't taste as good or mix as well with coffee. On the other hand, liquid coffee whiteners made from soy isolates have found wide consumer acceptance, although they do not have the shelf-life of their powdered counterparts.

Because coffee whiteners require long shelf-life and good flavor, it is likely that casein would continue to be used to assure those attributes. Since the proposals call only for restricted imports, casein from foreign countries would still be available. However, competition for these limited imports by manufacturers with no casein substitutes would bid up the price of casein to approximately the level where domestic production would become feasible. Producers could then use the higher priced domestic casein.

Other foods provide examples of substitutions that could occur if casein imports were restricted. Producers of processed meat products, such as imitation sausage, stews, and soups, for instance, need an ingredient that can bind water in the product and keep fat from escaping to the surface. In many imitation dairy products, such as whipped desert toppings, an ingredient that prevents "weeping" of liquids is also desired. In most of these products, skim milk solids could be used; casein is used mainly for economic reasons.

Soy proteins could replace casein in certain of these uses. Complete replacement of dairy protein is possible in many cream fillings, icings, and whipping creams, but further research is apparently necessary to obtain an acceptable flavor.

Dietary products encompass specially formulated food and medical products low in cholesterol and lactose-free. Casein-based products provide a protein source easily tolerated by people with medical problems, such as intolerance of lactose in milk. Other products using casein include coatings and binders for pills, weight-reduction formulations, protein powder formulas, and other special dietetic and infant food products. No substitutes can duplicate casein's role in the majority of these products.

With restricted imports and the resulting higher prices, manufacturers of a variety of casein-based products might use the more costly domestically produced casein if they felt they could recapture the higher ingredient cost.

In the industrial sector, for example, casein is an important component of glues and adhesives. Casein makes these products quick-setting, water-resistant, durable, able to adhere to different surfaces (such as paper on glass and aluminum foil to paper), and convenient. Casein is the main binding agent in adhesives, making them resistant to water and temperature extremes (important in bottle labeling) and stable when mixed with water.

Some manufacturers indicated that soy-based proteins and synthetics such as polyacrylate could be substituted for casein in glues and adhesives. But most manufacturers claimed that the resulting product

Table 2. Imports Supply the Needs of Growing Domestic Casein Uses

Year	Imports	Production	Change in stocks	Exports	Estimated domestic use				
					Total	Food	Feed	Industrial	Other
				Million pounds					
1940	24.5	46.6	—	—	60.2	(1)	(1)	56.4	3.8
1950	54.6	18.5	+.3	0.1	72.7	—	—	—	—
1955	74.5	3.1	—	.1	77.5	1.0	(1)	(1)	76.5
1960	92.2	.9	—	.1	93.0	4.7	—	—	—
1966	107.9	2.7	—	3.6	107.0	22.5	(1)	79.5	5.0
1970	135.0	0	—	3.7	131.6	39.5	26.3	65.8	0
1971	106.0	0	—	2.5	103.5	32.1	—	—	—
1972	105.4	0	—	1.9	103.5	33.1	—	—	—
1973	112.8	0	—	1.9	110.9	36.6	—	—	—
1974	112.9	0	—	2.3	110.6	37.6	—	—	—
1975	58.4	0	—	.7	57.7	—	—	—	—
1976	112.1	0	—	1.1	111.0	72.9	—	—	—
1977	144.1	0	—	.9	143.2	65.9	—	—	—
1978	137.0	0	+6.6	1.2	129.3	72.4	30.4	26.6	0
1979	150.8	0	+2.1	.7	148.1	87.7	32.1	28.2	0
1980	152.2	0	+12.3	1.0	138.9	95.8	22.7	20.5	0
1981	127.8	0	-15.4	.9	142.2	100.6	22.9	18.8	0
1982	176.8	0	-2.6	.6	178.8	136.1	23.6	19.0	0
1983	159.5	0	-28.7	1.2	187.0	142.1	—	—	—
1984	192.3	0	-4.5	2.8	194.0	146.7	—	—	—
1985	231.4	0	+33.3	2.3	195.8	146.9	23.9	25.0	0

(1) If any, included in other. — = Not available.

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would be inferior. In the past, however, when casein prices increased, many glue manufacturers have substituted soy protein.

Restricting Imports Means Higher Producer Costs

To estimate the costs associated with limiting foreign casein, ERS researchers considered the two methods of restricting imports permitted under Section 22 of the Agricultural Adjustment Act of 1935. The first method is a quota that would cut imports up to 50 percent from a specified base period. ERS researchers analyzed a quota based on 50 percent of average imports during 1981-85.

If the import quota was 88 million pounds, most users with ready substitutes would shift out of casein into alternative proteins *(table 3)*. All others would continue to use imported casein while bidding up the price of the available supply. However, casein use by these producers would eventually decline somewhat as consumer demand for some of their products would fall because of higher prices. Casein use by producers who could substitute skim milk would decline by about 57 million pounds.

The second method under Section 22 is an *ad valorem* tariff that would tax imported casein on the basis of its value. ERS researchers assumed this tariff would be set at 50 percent of the value. In 1985, this would have added 48 cents to the price of casein, which was about 96 cents a pound that year.

If a 50-percent tariff were imposed and the price of casein rose to $1.44 a pound, many users would shift to other ingredients where possible. About 46 million pounds of casein would be replaced, leaving about 130 to 135 million pounds to be imported. Little

increase in the use of domestically produced skim milk solids would result because producers would shift mainly to lower priced soy protein or whey protein concentrate.

A Less Costly Dairy Program?

To support the prices of dairy products, USDA's Commodity Credit Corporation (CCC) purchases butter, NFDM, and cheese. Because a 50-percent tariff would not greatly increase commercial use of skim milk solids, the tariff would have little impact on CCC purchases. The CCC's cheese purchases would also be unaffected if the ingredient cost of casein in cheese analogs (cheese substitutes, imitation cheese, and cheese blends) rose by as much as 12 cents a pound. This would still leave prices of these products substantially below natural cheese. If analog prices rose by more than 12 cents, moving closer to the price of natural cheese, then there might be a small shift in consumer demand toward natural cheese, relieving the CCC of some purchases.

The effect of a quota of 88 million pounds also depends on the extent to which natural cheeses displace analogs and skim milk solids displace casein in products. If there is only a partial shift from analogs to natural cheese, due to a narrowing of the price gap, ERS researchers estimate 32 million pounds of casein would be replaced by the skim milk solids used to make products other than cheese. As a result, commercial disappearance of skim milk solids would increase by the equivalent of about 100 million pounds of NFDM (3.16 pounds of NFDM are required to replace 1 pound of casein in commercial use). CCC purchases would decline by this amount, reducing Government costs about $84 million (based on the 1985 NFDM support price of 84 cents a pound), or 3 percent of 1985 dairy program costs, which totaled $2.2 billion.

At the other end of the range of possibilities, natural cheese might replace all cheese analogs because of the latter's higher costs. In such a case, estimated sales of about 280 million pounds of analogs (1985 data) would be replaced by commercial sales of only about 240 million pounds of natural cheese. At the higher prices for natural cheese, consumers will buy less though than they did of the analogs. With the boost in natural cheese demand, CCC costs could drop by about $300 million. Thus, the range of possible reductions in Government costs is $84 to $300 million.

Table 3. Several Product Groups Depended Heavily on Casein in 1980[1]

Use group	Million pounds
Group A—Alternatives to casein not available:	
Coffee whiteners (80 percent)[2]	10.6
Dietary products	12.5
Desserts and toppings (72 percent)	3.7
Bakery (10 percent)	.7
Total	27.5
Group B—NFDM or skim milk can replace casein:	
Cheese analogs	44.7
Animal feed (20 percent)	3.7
Coffee whiteners (20 percent)	2.7
Desserts and toppings (28 percent)	1.5
Other foods	13.5
Total	66.1
Group C—Soy or other proteins can replace casein:	
Industrial	20.5
Bakery (90 percent)	5.9
Pet food	4.4
Animal food (80 percent)	14.6
Total	45.4

[1]Based on International Trade Commission report. [2]Percent in parentheses is estimated share of casein use in that product falling in that substitution category.

For Consumers, It Could Mean Higher Prices

A 50-percent *ad valorem* tariff would increase the ingredient cost of consumer products by $66 million annually, given the continued use of 138 million pounds of casein.

A 50-percent quota would raise the price of casein to about $2.49 a pound, compared with the 1985 price of 96 cents. Domestic skim milk solids would substitute for 32 million pounds of the displaced imported casein. The remainder would be replaced by other proteins. Considering these two facts, ingredient costs of consumer products would increase an estimated $180 million. Those products for which soy proteins would be substituted for casein would see no significant price impact.

In addition to price, however, restricted imports would affect consumer choice. Since not all people have the same tastes, needs, and wants, consumer satisfaction usually increases as more products at reasonable prices are made available. A tariff or a quota that drives up the price of casein would increase prices for some products. In other cases, such restrictions could mean the elimination of products from the marketplace. Consumer choice would be constrained in either situation.

Cheese analogs are just one example. These products are now sold at lower prices than natural cheeses because imported casein costs substantially less than domestic skim milk solids. A quota or tariff would raise the ingredient cost of cheese analogs, thereby increasing retail prices and possibly limiting product availability.

Presumably a technical or cost advantage, or both, exists for products in which casein is presently being used. Therefore, an increase in its price or a limit on its availability would inevitably affect consumer choice. □

Diets of American Women: Looking Back Nearly a Decade

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What do American women choose to eat? Compared with nearly a decade ago, they choose more products such as pizza or spaghetti with meat sauce and less plain red meat, more skim and less whole milk, and more carbohydrates and less fat. These observations and others are part of a recent study that provides the first national assessment of women's diets since before the beginning of the decade.

The new study of women's diets is based on USDA's Continuing Survey of Food Intakes by Individuals (CSFII) initiated in 1985. The survey uses a national sample to observe dietary behavior of women 19-50 years old in response to economic change, nutrition and health promotions, and other factors affecting food consumption. The CSFII supplements USDA's comprehensive Nationwide Food Consumption Surveys (NFCS) taken every 10 years. The last NFCS was in 1977. Both the NFCS and CSFII are part of the National Nutrition Monitoring System.

As part of the CSFII, 1,503 women reported what they ate at home and away from home for 6 days spread over 1985. The first day's data were compared with a day's data for 2,228 women of the same age range interviewed for the 1977 NFCS. Data collection methods were similar for both years: Women were asked to recall their food intake—what they ate—over the past 24 hours. The interviews were conducted in the spring of both years.

There were some differences in the surveys. For example, to expand and improve estimates of dietary fat, the 1985 survey asked more questions about the trimming of meat and the types of fats used.

Food Selection: Similarities and Differences

Food selections by women in 1985 and 1977 were alike in many ways. Most women in both years had some food from each of four major groups. About 90 percent of them had at least one vegetable or fruit, at least one grain product, and at least one meat, poultry, or fish item. Only about 75 percent in each year had milk or a milk product.

While diets were similar from a broad perspective, women's diets in 1985 differed in several ways from those in 1977. One change was that today's women tend to eat more food as mixtures of two or more ingredients. For example, women ate an average of one-third more meat, poultry, and fish mixtures than in 1977—mainly in such forms as stews, sandwiches, and frozen entrees *(table 1)*. Grain mixtures, such as pizza and spaghetti, were up more than two-thirds.

While meat mixtures rose, about a third less meat—beef, pork, lamb, veal, organ

Table 1. What Women Ate in 1977 and 1985

	Average Intake, 1985			Change from 1977		
	All incomes	Low income[1]	High income[1]	All incomes	Low income[1]	High income[1]
	Grams			*Percent*		
Meat, poultry, fish	181	188	179	- 3	8	- 8
Meat[2]	56	64	48	-34	-16	-47
Poultry	22	29	22	- 8	0	-12
Fish, shellfish	13	13	12	18	18	20
Mixtures[3]	88	77	94	35	33	38
Milk, milk products[4]	259	203	270	4	-15	10
Whole milk	64	77	50	-35	-42	-32
Skim, lowfat milk	77	43	86	60	43	59
Cheese	18	12	20	6	- 8	0
Eggs	18	22	16	-28	-29	-30
Legumes, nuts, seeds	22	21	19	5	-16	12
Vegetables	173	144	186	- 7	-21	- 6
Fruits	119	86	140	- 7	-15	- 5
Grain products	209	234	209	29	31	28
Bread, other baked goods	95	89	98	10	5	11
Cereals, pastas	40	61	32	25	9	14
Mixtures[5]	74	84	79	72	127	68
Carbonated soft drinks	287	253	309	53	44	65
Regular	179	210	170	28	44	34
Low-calorie	105	42	138	123	40	130
Alcoholic beverages	84	50	110	53	47	43

[1]Low-income is defined as 130 percent of the poverty line and below; high income, over 300 percent of the poverty line. [2]Beef, pork, veal, lamb, organ meats (cooked edible parts only), frankfurters, sausages, and luncheon meats. [3]Mainly meat, poultry, or fish, such as stews and sandwiches. [4]Milk equivalent in terms of calcium content. [5]Mainly grain products, such as pizza and pasta with sauce.

Peterkin is acting administrator of USDA's Human Nutrition Information Service, and Rizek is director of that agency's Nutrition Monitoring Division.

For More Information

This article is a summary of just some of the aspects of CSFII-85. For more information on the survey itself and the diets of American men, women, and children see the following reports:

No. 85-1. Women 19-50 Years and Their Children 1-5 Years, 1 Day, 1985.

No. 85-2. Low-income Women 19-50 Years and Their Children 1-5 Years, 1 Day, 1985.

Upcoming reports include:

No. 85-3. Men 19-50 Years, 1 Day, 1985.

No. 85-4. Women 19-50 Years and Their Children 1-5 Years, 6 Days, 1985.

No. 85-5. Low-income Women 19-50 Years and Their Children 1-5 Years, 6 Days, 1985.

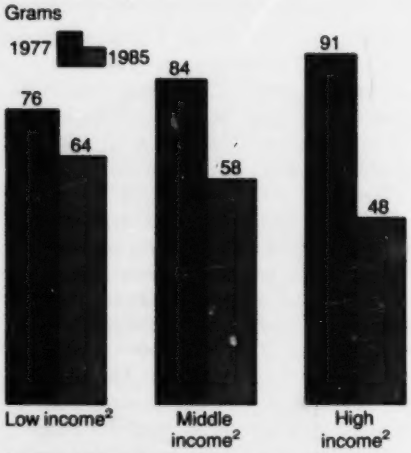
For information about these reports, write to Human Nutrition Information Service, Federal Building, Hyattsville, MD 20782, or call (301) 436-8457.

meats, sausages, frankfurters, and luncheon products—was eaten separately. The amount of poultry and fish and shellfish eaten in 1985 remained well below red meat and changed less from 1977 than the meat figures did.

Surveys for the last several decades have shown that consumption of red meat increases as income rises. People who could afford it bought meat and more of it. However, the 1985 CSFII suggests that pattern might be changing for women.

The amount and types of food eaten were assessed at three household income levels: low (130 percent of poverty and below), medium (131 to 300 percent of poverty), and high (over 300 percent of poverty). (For purposes of comparison, the Federal Government's official poverty level for a family of four was $5,850 in 1977 and $10,650 in 1985.) When looking at the 1977 data, the pattern of greater meat consumption by high-income women appears. In 1977, these women ate almost 20 percent more meat than low-income ones; in 1985, high-income women reported 25 percent less meat consumption than low-income women *(figure 1)*. Although the amount of meat eaten was lower in 1985 than in 1977 in both the high-income and low-income groups, the percentage decline was greatest for the high-income women (47 percent versus 16 percent).

Figure 1. Women's 1985 Meat Consumption Decreased as Income Rose[1]



[1]Average intake on surveyed day by women 19 to 50 years old.
[2]Low income defined as under 131 percent of poverty; middle income, 131 to 300 percent; high income, over 300 percent.

Source: Unpublished data from NFCS 77-78 and CSFII-85, HNIS, USDA.

Women Drinking More Skim or Lowfat, Less Whole Milk

As a group, women used about the same amount of milk and milk products in 1977 and 1985. However, the women drank about 35 percent less whole milk in 1985 than in 1977, while lowfat and skim milk was up 60 percent. Low-income women consumed 15 percent less milk and milk products in 1985 than in 1977; high-income women, 10 percent more. Lowfat and skim intake was higher at each of the three income levels in 1985, but the spread between 1985 and 1977 was greatest for the high-income women. Furthermore, in 1985, high-income women took about two-thirds of their fluid milk as skim or lowfat, compared with one-third for low-income women. *(For more information on milk and calcium intake by women, see next article.)*

Despite nutrition advice to eat more vegetables and fruits, the amount eaten by women in 1985 didn't gain from 1977. In fact, low-income women ate somewhat less.

On the whole, women ate more grain products in 1985 than in 1977. Grain mixtures, such as pizza and pasta with sauce, had the greatest gain over the period.

These increases were apparent for all three income groups, though low-income women led with a 127-percent rise.

Carbonated soft drinks also rose, from an average of about 6 ounces a day for all women in the 1977 survey to about 10 ounces in 1985. On the day surveyed, 54 percent of the women drank soft drinks. These soft drink users averaged about 18 fluid ounces a day. Women in all three income groups drank more soft drinks, with the largest gains for high-income women. Low-calorie soft drinks were more popular among high-income women, accounting for 45 percent of their soft drinks, compared with 17 percent among low-income women.

American women are eating more meat mixtures, drinking more soda, and replacing more whole milk with skim and lowfat.

The Bottom Line: Is the Diet Nutritious?

A shift in how much is eaten of a single food or type of food by itself is not nutritionally bad or good. Rather, the total diet must be assessed for nutritional quality.

The nutrient content of foods eaten was estimated using data bases developed by USDA's Human Nutrition Information Service. Estimates for 1977 reflected food composition data for 15 food components available at the time of the 1977 survey. However, the number of food components studied was expanded to 27 in the 1985 survey. The 27 components included food energy (calories), protein, three types of fat and total fat, cholesterol, carbohydrate, dietary fiber, ten vitamins and six minerals, and two electrolytes (sodium and potassium).

Not only have more components been studied, but the actual nutrient content of certain foods has changed since 1977. Some of the change is attributable to new varieties of familiar foods, such as carrots and sweet potatoes, which are now deeper in color and contain more vitamin A. Also, more nutrients have been added to some foods that are enriched and fortified. For example, the amount of iron and B-vitamins added to bread that is labeled "enriched" is higher than it was in 1977.

The average diet of American women in 1985 was above the Recommended Dietary Allowances (RDA's) for eight of the 15 nutrients studied for which RDA's are set. The eight were protein, vitamin A, thiamin, riboflavin, niacin, vitamin B12, ascorbic acid, and phosphorous. Women were taking in less than the RDA's of vitamin B6, folacin, vitamin E, calcium, iron, magnesium, and zinc. Consuming less than the RDA's does not necessarily signal an inadequate diet, because to be on the safe side, the RDA's are set above the needs of most people. However, the risk of inadequacy is greater for groups with average intakes that fall below the RDA's.

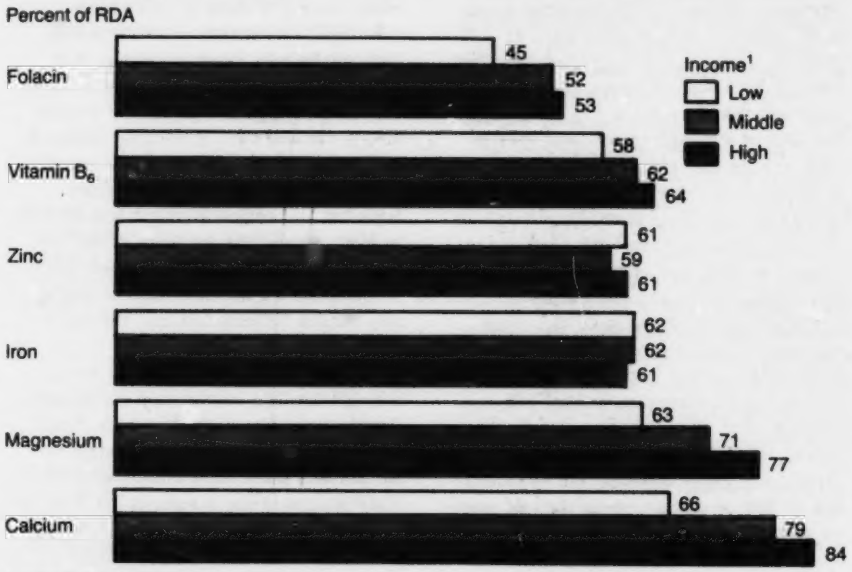
Of the seven nutrients falling short of the RDA's, only vitamin E, at 97 percent, came close. Women's consumption of the other six in 1985 averaged half to three-fourths of the RDA's. However, compared with 1977, consumption was as high or higher for four of the six: calcium, magnesium, iron, and vitamin B *(table 2)*. Cal-

Table 2. Calcium Gains Most, Though Still Below RDA's[1]

Nutrient[2]	1977	1985
	Percent of RDA	
Food energy	77	82
Calcium	69	78
Iron	56	61
Magnesium	71	72
Zinc	(3)	60
Vitamin B_6	60	61
Folacin	(3)	51
Vitamin E	(3)	97

[1]One day, spring 1977 and 1985. [2]Includes only nutrients where women's average intakes were below RDA's. [3]Intake not estimated in 1977.

Figure 2. Diets of High- and Low-Income Women are Short of RDA Goals for Some Nutrients



[1]Low income defined as under 131 percent of poverty; middle income, 131 to 300 percent; high income, over 300 percent.
Source: CSFII-85, HNIS, USDA.

Figure 3. Fat Provided Less of Women's Calories in 1985

Source: CSFII-85, HNIS, USDA.

cium showed the most improvement, rising from 69 percent of the RDA in 1977 to 78 percent in 1985. Zinc and folacin were not studied in 1977.

Consumption of calcium, magnesium, vitamin B6, and folacin increased slightly with income in 1985, but iron and zinc did not *(figure 2)*. This probably reflects the fact that high-income women ate less meat—rich sources of iron and zinc.

The major nutritional change between 1977 and 1985 was in the sources of calories. Of the primary sources of calories (carbohydrates, fat, and protein), the amount of carbohydrates increased, while fat decreased *(figure 3)*. Carbohydrates from starch and sugars provided 46 percent of calories in 1985, up from 41 percent. Fat provided 37 percent of calories, down from 41 percent in 1977. The percentage of calories from fat declined for all three income groups, with a less pronounced decline for high-income women. These reported differences may reflect updated nutrient data bases and improved survey procedures, such as increased, detailed questioning by 1985 interviewers concerning the use of fat, as well as actual changes in consumption. □

Calcium in Women's Diets

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The Winter 1986 (NFR-32) issue of the National Food Review included "Closeup on Calcium" in the food supply. The following article provides another look at that topic, focusing on the amount of calcium in the diets of women—the group that often falls short of recommended levels of calcium.

For many years we've heard of calcium's role in building strong bones in children. More recently, however, evidence has indicated that too little calcium is one factor associated with osteoporosis, a bone disorder characterized by decreased bone mass and increased susceptibility to fractures—occurring more frequently in women. A 1985 USDA food consumption survey reveals that the average amount of calcium in the diets of American women 35-50 years old is less than 80 percent of the current Recommended Dietary Allowances (RDA's).

What's more, in 1984 the National Institutes of Health Consensus Conference on osteoporosis concluded that the current RDA of 800 milligrams (mg) of calcium for women is too low. Although dietary calcium is only one of the factors associated with the development of osteoporosis in post-menopausal women, the conference panel recommended increasing the level to 1,000 to 1,500 mg per day as a preventive measure, beginning well before menopause.

In light of heightened concern about calcium, researchers at USDA's Human Nutrition Information Service (HNIS) recently looked at how much calcium women take in and from what foods they receive it. The data were taken from the 1985 Continuing Survey of Food Intakes by Individuals (CSFII) *(see sidebar box)* and were compared with the same information from the 1977-78 Nationwide Food Consumption Survey (NFCS).

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Calcium Intake Up, But Varies Among Groups of Women

As the first step in assessing the amounts of dietary calcium, HNIS researchers compared women's diets in 1985 and 1977. In general, women in 1985 reported diets that were about 5 percent higher in food energy (calories) than they did in 1977. Similarly, the diets of the 1985 respondents were as high or higher in vitamins and minerals. However, interviewers for the 1985 survey asked more questions to ensure respondents included often-forgotten foods, and this increased probing may account for some of the rise in calories and nutrients.

The average calcium intake of women was significantly higher in 1985 than in 1977 *(table 1)*. For women 19 to 34 years old, it rose 12 percent to 685 mg per day. Women 35 to 50 reported an increase of almost 18 percent to 606 mg per day. Despite the gains, however, the 1985 average amount of calcium in the diets of women 19 to 34 was only 81 percent of the RDA and only 75 percent of the RDA for the older group. In both survey years, women 19 to 34 reported diets significantly higher in calcium than those 35 to 50 years old.

Between 1977 and 1985, the average amount of dietary calcium increased significantly for white women, women living in the Midwest or South, in the central city or suburban areas, and at middle and high incomes *(table 2)*. In both years, the average amount of calcium in the diets of black women was significantly lower than that of white women or those of other races.

In 1985, low-income women reported diets signficantly lower in calcium than women with middle or high incomes. Among middle- and high-income women, dietary calcium was significantly higher in 1985 than in 1977. No signficant increase was noted for the low-income women. High-income women averaged 688 mg daily in 1985, versus 549 for those in the low-income group. In contrast, average daily consumption for the three income classes only ranged between 548 and 581 mg in 1977.

In the 1985 survey, all women were asked about their employment status, education, and number of children ages 1 to 5 they had at home. (Only a subsample of women was asked these questions in 1977). Sixty percent of the women in the 1985 survey were employed either full- or part-time but their calcium intakes didn't differ significantly from those not working. About 4 percent of the women in the 1985 survey had at least some college, while 59 percent had a high school education or less. On average, women with a college background had significantly more calcium in their diet than the others. Approximately 27 percent of the women had at least one child 1 to 5 years old at home. These women had sig-

Table 1. Calcium in Women's Diets Rises from 1977 to 1985

Age	1977	1985	1977	1985	1977	1985
	mg/day		*mg/1,000 Kcal*		*Percent of RDA*	
Women						
19 to 34	611	685[1]	389	402	74	81[1]
35 to 50	515	606[1]	352	392[1]	64	75[1]
All	570	651[1]	374	398[1]	69	78[1]

[1]Statistically significant increase from 1977 to 1985.

Source: U.S. Department of Agriculture's 1977-78 Nationwide Food Consumption Survey and 1985 Continuing Survey of Food Intake by Individuals.

Table 2. Amount of Dietary Calcium Varies Among Women

	1977	1985
	mg/day	
Race		
White	588	678[1]
Black	471	487
Other	486	549
Region		
Northeast	603	633
Midwest	581	730[1]
South	491	576[1]
West	636	702
Income		
Low[2]	548	549
Middle[2]	583	667[1]
High[2]	581	688[1]
Urbanization		
Central city	591	684[1]
Suburban	573	653[1]
Nonmetropolitan	547	598
Employment[3]		
Employed (full- or part-time)	NA	659
Not employed	NA	640
Education[3]		
High school or less	NA	606[4]
Some college	NA	716
Child 1-5 years at home[3]		
None present	NA	630[4]
At least one	NA	706

[1]Statistically significant increase from 1977 to 1985. [2]Low income is below 131 percent of the poverty level; middle, 131 to 300 percent; high, over 300 percent. In 1977, the poverty level for a family of four was $5,850, versus $10,650 in 1985. [3]Comparable data were not available for these characteristics in 1977. [4]Statistically significant difference between groups.

Source: U.S. Department of Agriculture's 1977-78 Nationwide Food Consumption Survey and 1985 Continuing Survey of Food Intake by Individuals.

nificantly more calcium in their diets than those with no children this age.

While the amount of calcium in the diet varies by income, education, and race, these characteristics are not necessarily the causes. Diet is affected by many factors, some of which are difficult to measure, such as food preferences and attitudes towards food and health.

Beyond total daily calcium intake, it is also important to look at the amount obtained per 1,000 calories, technically termed calcium density. The more calcium per 1,000 calories in the diet, the more calcium dense it becomes. For example, a diet containing several foods, such as lowfat dairy products or green leafy vegetables that are calcium rich yet low in calories, is likely to be calcium dense. Overall, the calcium density of women's diets was significantly higher in 1985 than in 1977, suggesting that women ate more foods that are good sources of calcium and relatively low in calories.

Dairy Products: Major Providers of Calcium

Calcium can come from many foods, but milk and milk products were the major contributors to women's calcium intake in 1985, providing about 36 percent *(figure 1)*, compared with 39 percent in 1977. Fluid milk, including whole, lowfat, and skim, contributed about 19 percent in 1985. The food group contributing the next largest share of calcium was grain products, including breads and other baked goods, cereals, pastas, and grain mixtures such as macaroni and cheese and pizza. These foods accounted for 26 percent of total calcium in women's diets.

In the one-day recall, fewer women reported using fluid milk in 1985 than in 1977. However, there was no significant difference in the average amount consumed, suggesting that those who drank milk increased their share. Women's consumption of whole milk was significantly lower in 1985 than in 1977, while skim and lowfat milk was significantly higher *(table 3)*.

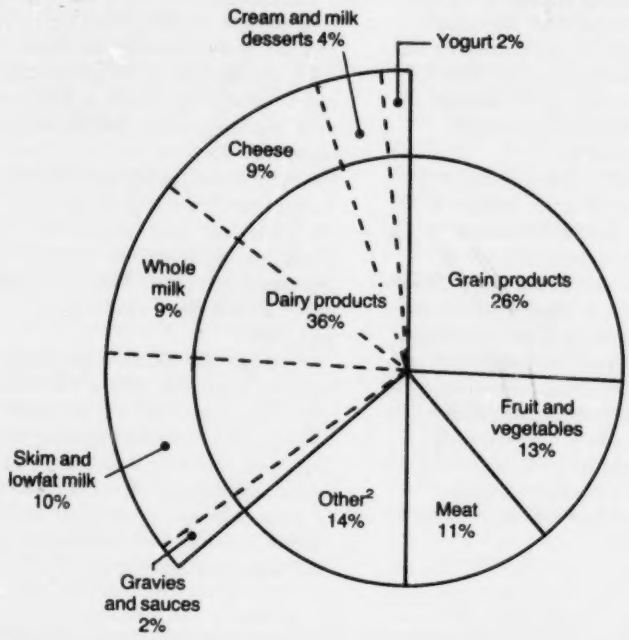
About the Data Sources...

The results reported in this article were drawn mainly from two USDA food consumption surveys. In the 1977-78 Nationwide Food Consumption Survey, 36,000 people reported what they ate for 3 consecutive days. The survey asked a wide variety of questions regarding what was eaten, how much, and the source of the food, as well as a number of characteristics about the individuals and their households.

USDA's HNIS researchers used the data from the first of these 3 days in the 1977 survey (involving 2,228 women 19 to 50 years of age) and compared them with the first 1-day recall from the HNIS Continuing Survey of Food Intakes by Individuals. The 1985 survey includes six 1-day dietary recalls by 1,503 women and their children, if any, between 1 and 5 years. Survey data were collected over a year.

Data from the first 1-day recall for 1985 have been published in the *Nationwide Food Consumption Survey: Continuing Survey of Food Intakes by Individuals, Women 19 to 50 Years and Their Children, 1 to 5 Years, 1 Day.* The report is available from the U.S. Government Printing Office, Washington, D.C. 20402. The stock number is 001-000-04458-3, and the price is $4.50. Make checks or money orders payable to the Superintendent of Documents. For faster service, call the GPO order desk at (202) 783-3238.

Figure 1. Dairy Products Provided the Largest Share of Women's Calcium in 1985[1]



[1]Women 19 to 50 years old. [2]Includes eggs, nuts, seeds, legumes, fats and oils, sugars and sweeteners, and alcoholic and nonalcoholic beverages.
Source: CSFII-85, HNIS, USDA.

Table 3. Women's Consumption of Dairy Products

	Intake		Women using	
	1977	1985	1977	1985
	Grams per day		*Percent*	
Total fluid milk	148	141	54.9	51.4
Whole	98	64[1]	39.0	26.0
Lowfat/skim	48	77[1]	16.1	26.1
Yogurt	6	8	2.9	4.5
Cheese	17	18	27.5	33.9
Cream and milk desserts	19	24[1]	20.0	25.0

[1]Statistically significant difference from 1977 to 1985.

Source: U.S. Department of Agriculture's 1977-78 Nationwide Food Consumption Survey and 1985 Continuing Survey of Food Intake by Individuals.

Some recent studies have shown that women getting a lot of calcium obtain a greater percentage of it from dairy products than women with low calcium intakes. An HNIS study using NFCS 1977-78 data revealed that women consuming 800 mg or more of calcium obtained more than 60 percent from milk and milk products. Women getting less than 560 mg obtained only 30 percent of their calcium from dairy products. Results of a Pennsylvania State University study using the 1977 data showed that, for over three-quarters of those surveyed, whenever two or more foods from the milk group were reported in one day, the calcium intake was at least 80 percent of the RDA.

Many women who want to increase their consumption of milk and milk products to meet calcium needs may be concerned about the fat content of some of these foods. In 1985, the milk and milk products group contributed about 11 percent of women's total calories and about 14 percent of their fat intake. Most of the fat from this group comes from cheese, cream, and milk desserts. Skim and lowfat milk, considered rich in calcium yet low in calories, overall provided 10 percent of women's total calcium and only 2 percent of the total fat in their diets. Switching from whole to lowfat milk products as a way to avoid too much fat in the diet is one of the tips suggested in the Dietary Guidelines for Americans, issued by the Departments of Agriculture and Health and Human Services (HHS).

Milk is an important source of calcium. However, only about half of all women reported using fluid milk in the 1985 survey. The overall average daily intake was 141 grams or about half a cup. About 20 percent reported avoiding whole milk only, while 7 percent indicated they avoided all milk.

As might be expected, women avoiding milk of all kinds had a significantly lower average calcium intake than those who didn't. However, the average amount of calcium in the diets of women who said they only avoided whole milk was signficantly higher than those not avoiding whole milk. Women who avoided whole milk likely chose to drink skim or lowfat instead, and in large enough amounts to significantly increase the calcium in their diets.

For women who do not drink milk regularly, alternate sources of calcium become increasingly important. These include products made from milk, such as yogurt and cheese; dark green leafy vegetables, such as kale, spinach, and collards; and fish with edible bones, such as salmon and sardines.

Beverage Choices and Other Dietary Trends

With milk consumption down, what other beverages are American women drinking? For a starter, the average daily intake of carbonated soft drinks rose from 6 fluid ounces in 1977 to about 10 fluid ounces in 1985. Over half of the women surveyed in 1985 drank carbonated soft drinks. Women's consumption of both regular and low-calorie soft drinks rose signficantly. In fact, consumption of low-calorie soft drinks doubled between 1977 and 1985.

In 1985, 15 percent of the women surveyed reported using alcoholic beverages, compared with 12 percent in 1977. Women reported drinking significantly more alcoholic beverages in the one-day recall in 1985 than in 1977—84 grams a day in 1985 (about 3 fluid ounces), compared with 55 grams (about 2 fluid ounces) in 1977. Trends in alcohol use, however, are difficult to interpret from a survey of this type for several reasons, including possible intentional underreporting.

Over half of the women surveyed in 1985 reported drinking coffee and one-third, tea. The average amount of each consumed by all women did not change significantly from 1977 to 1985.

Approximately 13 percent of the 1985 respondents reported that they were currently on a special diet, the majority of these being low-calorie diets. Women on a special diet had significantly less calcium in their diets than other women. However, the calcium density of their diets was significantly higher than those not on special diets, suggesting those on diets included more calcium-dense foods in their meals. In 1985, 4 percent of the women reported they were vegetarians; the average amount of calcium in the vegetarians' diets did not differ significantly from other women. But here again, their calcium density was above that of nonvegetarians.

The percentage of women who reported using vitamin and mineral supplements increased from 39 percent in 1977 to 58 percent in 1985. Interestingly, in both years, supplement users got more calcium from food than the nonusers. These findings were similar to those found in the recent HHS National Health and Nutrition Examination Survey II. Since it is difficult to collect accurate figures on the quantity and dose of supplements taken, the amount of calcium provided by them is usually not reported. However, a 1980 Food and Drug Administration survey revealed that women between 25 and 64 years who used supplements got an average of 24 percent of their RDA for calcium from them. □

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Finding Best Buys Among Meats and Alternates

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Meat, poultry, and fish are sources of high-quality protein. Together they supply nearly half of America's total protein intake. In addition, they provide several B vitamins, iron, zinc, and certain other minerals. Several of these nutrients fall short of recommended levels in U.S. diets.

However, most meat, poultry, and fish items are expensive relative to other foods, accounting for over a third of all money spent on food used at home. Careful selections among these items, nevertheless, can mean savings.

If additional savings and variety are desired, some meat can be replaced with meat alternates, such as dry beans, dry peas, peanut butter, and eggs. Meat alternates are usually less expensive than meat, yet provide protein and many other nutrients found in meat, poultry, and fish. In fact, it's nutritionally beneficial to vary choices among meats and meat alternates since each of these foods has distinct advantages.

Comparing Costs

One way to find the best buys among meats and meat alternates is to compare the cost of foods that provide 20 grams of protein—about a third of the Recommended Dietary Allowance for a man and nearly half for a woman *(table 1)*. This is the approximate amount of protein in a single serving (about 3 ounces) of cooked lean beef, pork, lamb, veal, chicken, turkey, or fish.

The cost of 20 grams of protein from the various meats and meat alternates reflects differences in retail prices and in the amount needed to provide 20 grams. For example, turkey at 35 cents for 20 grams of protein is a better buy than bacon at $1.01. The average retail price of turkey was $1.05 a pound in 1985, versus $1.94 for bacon. Furthermore, only one-third of a pound of turkey is needed to provide 20 grams of protein, compared with over half of a pound of bacon *(table 2)*. Equal to about 10 slices of bacon, this is well over the usual serving size.

For some other meats and alternates, well over a serving is also required for 20 grams of protein: four frankfurters, three and a half eggs, or four and a half tablespoons of peanut butter, for example. (Generally, smaller amounts of these foods can be used with other protein sources to provide the day's needs.)

Regional variation in protein costs for specific items is due to differences in retail prices. For some products, canned tuna or peanut butter for example, the cost difference among regions in 1985 was very small—2 to 3 cents per 20 grams of protein. For other products, such as smoked ham or chicken breasts, the difference was much greater—9 cents per 20 grams *(table 2)*.

Price differences among meats and meat alternates within regions can make some items a better buy in one area than another. The 1985 average retail price of canned salmon, for example, was much lower in the West than elsewhere. As a result, salmon ranked as the eighth cheapest sour of protein in the West, but twelfth in othe regions *(table 3)*.

Though the order of best buys among meats and their alternates is not identical for the United States and each region, egg beef liver, peanut butter, whole chicken, regular ground beef, frozen turkey, and canned tuna were consistently among the top seven in 1985. These products ranged from a U.S. average of 22 cents for 20 grams of protein from eggs to 36 cents fo canned tuna. Among the most expensive sources of protein for each region were ba con, rib roast, and porterhouse steak, all three posting a U.S. average of more than dollar for 20 grams of protein.

Table 1. Recommended Dietary Allowances for Protein

	Age	Grams of protein per day
Children	1-3	23
	4-6	30
	7-10	34
Males	11-14	45
	15-18	56
	19 and older	56
Females	11-14	46
	15-18	46
	19 and older	44
	Pregnant	75
	Lactating	65

Source: National Academy of Sciences, "Recommended Dietary Allowances," Ninth Edition, 1980.

Looking at Other Meat Alternates

Dry beans and peas are economical sources of protein. (About 1-1/3 cups of cooked dry beans or peas provide 20 gram of protein). In fact, past studies using pric for just Washington, D.C., showed these foods to be the best protein buy. However, these meat alternates were not included in the latest Human Nutrition Information Service estimates because nationwide price were not available.

In addition to protein, dry beans and peas, like meat items, are good sources of other nutrients—some of them below recom mended levels in many diets. Dry beans an peas are also excellent sources of starch an dietary fiber—two substances stressed in th latest version of the Departments of Agriculture and Health and Human Services' Dietary Guidelines for Americans *(see NFR-33)*.

Like meat, dairy products are good sources of high-quality protein. Some, such as milk, are among the most economical protein sources; others, such as yogurt, are as costly as the more expensive cuts of meat. While cheese and yogurt are used as main dishes at some meals, they are not considered meat alternates because they are

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relatively poor sources of several minerals. For example, red meat is an important source of iron in the diet, but milk and milk products are low in this nutrient.

Although grain products are generally not used as meat alternates in meals, they do provide protein. However, this protein is lower quality than that in meat, because it does not supply as complete an assortment of amino acids—the building blocks of protein—as animal products do. However, grain products contain several other important nutrients for which meats and alternates are valued, including iron and niacin.

Furthermore, most grain products are economical and can be used in many ways to help stretch the food dollar. For example, bread and other grain products, such as pasta and rice, can be used in a main dish along with a small amount of meat, poultry, fish, or cheese. In such combinations, the lower quality protein in the grain product is complemented by the higher quality protein in meat.

Other Considerations May Affect Choices

The cost of protein is only one consideration in selecting meats and meat alternates. Although they are rich sources of protein and other important nutrients, some also contain considerable amounts of fat and dietary cholesterol. The Dietary Guidelines suggest, among other recommendations, that consumers "avoid too much fat, saturated

Table 2. From Eggs to Steak: Cost of 20 Grams of Protein Varies[1]

Food	Market unit	Percent of market unit to give 20 grams of proteins[2]	Cost of 20 grams of protein	
			United States	Range for regions
		Percent	*Dollars*	
Eggs, large (grade A)	doz.	28	.22	.20-.25[3]
Beef liver	lb.	25	.24	.23-.24
Peanut butter	18 oz.	14	.24	.23-.26
Chicken, whole, ready-to-cook	lb.	42	.32	.30-.35
Ground beef, regular	lb.	27	.33	.31-.37
Turkey, whole, frozen	lb.	33	.35	.34-.36
Tuna, light chunk, canned	6½ oz.	42	.36	.36-.38[3]
Ground chuck	lb.	25	.42	.40-.46
Ham, half, smoked, bone-in	lb.	33	.42	.39-.48
Chicken breasts, bone-in	lb.	27	.45	.42-.51
Chuck roast of beef, bone-in	lb.	29	.46	.44-.49
Salmon, pink, canned	15½ oz.	22	.50	.47-.52[3]
Round roast of beef, bone-out	lb.	23	.57	.55-.60
Round beefsteak, bone-out	lb.	22	.62	.58-.64
Ham, canned (3-5 lb.)	lb.	26	.67	.65-.68
Frankfurters, all meat	lb.	39	.71	.65-.73
Pork chops, center cut, bone-in	lb.	32	.75	.71-.79
Sirloin beefsteak, bone-in	lb.	26	.77	.75-.80[3]
Haddock fillets, frozen	lb.	26	.78	.64-.81[3]
Bologna	lb.	38	.80	.77-.90
Pork sausage, bulk	lb.	47	.82	.78-.87[3]
Bacon, sliced	lb.	52	1.01	.98-1.07
Rib roast of beef, bone-in	lb.	32	1.05	1.03-1.08
Porterhouse beefsteak, bone-in	lb.	30	1.21	1.18-1.24

[1]Based on 1985 average monthly retail price of food items collected by the Bureau of Labor Statistics, U.S. Department of Labor, and the National Marine Fisheries Service, U.S. Department of Commerce. [2]About one-third of the daily recommended allowance for a man. [3]Price data available in only three regions.

Going Shopping?

USDA's Human Nutrition Information Service (HNIS) estimates of the cost of protein provide guidelines for finding the best buys among meats and meat alternates. But prices do vary among cities and supermarkets within a city. What's more, the costs of items are heavily influenced by "specials." Therefore, the most meaningful comparisons are those consumers make where they shop.

To compare protein costs from different sources, multiply the retail price by the part of a pound or other market unit that results in 20 grams of protein *(see "percent of market unit" column in table 2)*. For example, if whole chicken costs 69 cents a pound, the calculation would be .69 x 42 percent = 29 cents per 20 grams of protein.

Twice each year, HNIS publishes nationwide costs of meats and meat alternates. For a free copy of the most recent cost comparisons, contact the Human Nutrition Information Service, Room 325A, 6505 Belcrest Road, Hyattsville, Maryland 20782. Further information on finding best buys in meats and other foods is provided in Home and Garden Bulletin Number 183, "Your Money's Worth in Foods" and in Home and Garden Bulletin Number 244, "Thrifty Meals for Two: Making Food Dollars Count." These publications may be purchased from the Consumer Information Center, Pueblo, Colorado 81009 at a cost of $2.25 and $2.50, respectively.

Table 3. Ranking the Costs of Meats and Alternates

Food	United States	Northeast	Midwest	South	West
			Order of cost[1]		
Eggs, large (Grade A)	1	3	1	1	NA
Beef liver	2	1	2	2	1
Peanut butter	3	2	3	3	2
Chicken, whole, ready-to-cook	4	4	4	4	4
Ground beef, regular	5	6	5	6	3
Turkey, whole, frozen	6	5	6	5	5
Tuna, light chunk, canned	7	7	NA	7	6
Ground chuck	8	8	7	10	7
Ham, half, smoked, bone-in	9	9	9	8	9
Chicken breasts, bone-in	10	10	8	9	11
Chuck roast of beef, bone-in	11	11	10	11	10
Salmon, pink, canned	12	12	NA	12	8
Round roast of beef, bone-out	13	13	11	13	12
Round beefsteak, bone-out	14	14	12	14	13
Ham, canned (3-5 lb.)	15	16	14	15	14
Frankfurters, all meat	16	17	13	16	15
Pork chops, center cut, bone-in	17	18	15	17	16
Sirloin beefsteak, bone-in	18	19	16	21	NA
Haddock fillets, frozen	19	15	NA	20	17
Bologna	20	20	17	19	18
Pork sausage, bulk	21	NA	18	18	19
Bacon, sliced	22	21	19	22	20
Rib roast of beef, bone-in	23	22	20	23	21
Porterhouse beefsteak, bone-in	24	23	21	24	NA

[1]From least to most costly. NA = Price data not available.

Source: Based on costs per 20 grams of protein calculated from 1985 average monthly retail price of food items collected by the Bureau of Labor Statistics, U.S. Department of Labor, and the National Marine Fisheries Service, U.S. Department of Commerce.

fat, and cholesterol." Here are suggestions to implement this guideline:

- Choose lean meat, poultry, fish, and dry beans and peas as protein sources.
- Trim visible fat from meat before cooking. Remove skin from poultry.
- Broil, roast, or simmer meat, poultry, and fish without adding fat. Drain off fat that accumulates during cooking.
- Moderate use of egg yolks and organ meats (such as liver). They are high in cholesterol.
- Use skim and lowfat milk and milk products.
- Moderate use of large amounts of fat as an ingredient in foods you prepare and as spreads for breads.

Comparative preparation time is another factor to consider in selecting meats and meat alternates. Foods in this study covered a wide range of preparation times—from little or none for peanut butter and tuna to 2 to 3 hours or more of cooking time for some larger cuts of meat.

Some of the lower cost selections are also low in fat, saturated fat, and cholesterol, but take longer to prepare—dry beans and peas, for example. On the other hand, foods such as eggs, liver, and peanut butter are economical and quick, but are relatively high in either cholesterol or fat. □

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USDA Actions

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USDA regularly implements operational and regulatory changes that affect the status of food and nutrition in the United States. Some of the recent changes are summarized below.

Heptachlor Contamination: In response to the contamination of milk and dairy cattle with the banned pesticide, heptachlor, and the resulting herd quarantines, USDA's Farmers Home Administration (FmHA) will make additional loans available to affected dairy farmers already borrowing from the agency. The contamination affected dairy farmers in parts of Arkansas, Missouri, and Oklahoma. Operators can use the loan funds to buy feed and replace dairy cattle that must be sold or destroyed. FmHA will also increase its loan guarantee program for lenders in these areas.

Dairy Termination Program: USDA has accepted 13,988 bids to participate in the dairy termination program, popularly called the whole-herd buyout, mandated by the Food Security Act of 1985. Many of the 39,534 dairy farmers who applied submitted multiple bids—up to one for each of the three disposal periods—so the total number of bids exceeded 105,700. The disposal periods—the times when producers must export or slaughter their dairy cattle—are April 1-August 31, 1986; September 1, 1986-February 28, 1987; and March 1-August 31, 1987. Bids per hundredweight (cwt) of milk ranged from $3.40 to over $1,000. The maximum bid accepted was $22.50. In the case of multiple bids by an individual, where at least one bid was $22.50 per cwt or less, the lowest bid was accepted. The dairy termination program will cost $1.827 billion, spread out over 5 years. Based on participants' 1985 marketings, the program's average cost per cwt will be $14.88. Assessments will result in an estimated total collection of $650 to $700 million. Therefore, the dairy industry will pay for about 38 percent of the cost of the termination program.

USDA accepted 13,988 bids to participate in the dairy termination program.

To offset the impact of the increased slaughter on livestock markets, USDA will purchase 400 million pounds of red meat. These purchases are in addition to quantities normally bought for the school lunch program and other domestic feeding programs. Of the 400 million pounds, 200 million will be donated to domestic charitable organizations for the needy, nutrition programs for the elderly, nonprofit summer camps for children, and other child nutrition programs. The other 200 million pounds will be exported. Purchases of canned and ground beef began on March 28. Purchases of other red meat products will coincide with the disposal periods.

Biotechnology: USDA has established an Office of Agriculture Biotechnology, which will have responsibility for developing and implementing policies and procedures relating to biotechnology. The new office will assist USDA's Agricultural Recombinant DNA Advisory Committee and the National Biological Impact Assessment Program.

Poultry Grade Standards: USDA has revised its voluntary grade standards for poultry products. The revisions eliminate the duplicate requirement for grading boneless breast and thigh parts before and after deboning. Instead, they will be graded only after they are deboned. The revisions provide an additional option for printing the USDA grademark on poultry product packages. Processors will have greater flexibility in displaying the grademark on packages, so that it is easily visible and compatible with various colors of packaging materials.

Bonus Flour for Schools: Since May 20, States have been eligible to receive unlimited amounts of flour for their school lunch and breakfast programs once they use the amount of flour they usually receive. The bonus flour will not be counted as part of the States' regular allotments of USDA-donated foods. The announcement was made so that schools may make plans for next year.

Inspection of Processed Fruits and Vegetables: USDA has issued revised regulations covering inspection and certification of processed fruits, vegetables, and related products. The major changes revise sampling plans by limiting the lot size to correspond to a sample size with a maximum of 29 units; revise and readjust the schedule of fees and charges for inspection; and pro-

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The Federal marketing order for red tart cherries expired at the end of August this year.

vide for control of labels bearing approved grade or inspection marks when a contract for service is canceled.

Honey Promotion Order: Honey producers and importers have voted to adopt a Federal research, promotion, and consumer information order. In a referendum conducted in May, 87.5 percent of honey producers and importers voted for the order, which was authorized by the Honey Research, Promotion, and Consumer Information Act of 1984. Funds to administer the program will be derived from assessments on producers and importers of honey. Only those who produce or import 6,000 pounds or more annually will pay into the program. The assessment will be 1 cent per pound for the first year and cannot be increased more than ½ cent per year thereafter. The maximum assessment cannot exceed 4 cents per pound. A producer or importer who doesn't wish to support the program can obtain a refund on written request. The Honey Board—a 13-member group of producers, packers, importers, and a public representative appointed by the Secretary of Agriculture—will administer the program.

Oriental Fruit Fly: Since June 14, fresh fruits and vegetables have again moved interstate from areas of California's Los Angeles, Orange, and Santa Clara Counties. These areas had been quarantined since last fall to prevent the spread of the oriental fruit fly. Because of a State-Federal effort, this destructive pest has been eradicated from California.

Surplus Cheese: States may now request additional supplies of surplus cheese for distribution to low-income households through the Temporary Emergency Food Assistance Program. Quarterly allotments of surplus cheese and other commodities are offered to States on a formula using poverty levels and unemployment statistics. Previously, when some States did not order their full allotments of cheese and other States requested additional allotments, reallocations were handled informally on a regional basis. The new system formalizes reallocations on a national basis. When States do not order their full allotments, the remainder will be entered into a national pool. States requesting additional cheese will be able to receive a share of this pool, based on the same factors used in the initial allocations.

Nitrite Levels in Bacon: Effective July 16, the U.S. Department of Agriculture began permitting new methods of processing bacon with less nitrite than previously required. The rule allows plants with USDA-approved quality control programs to reduce sodium nitrite levels in bacon from the previously required 120 parts per million (ppm) to 100 ppm. Nitrite is used to cure or preserve meats and to help prevent botulism, a rare but serious food poisoning. The rule also permits a new method for making bacon—using lactic acid starter cultures and sugar in a curing solution with 40 to 80 ppm sodium nitrite. Only packers with approved quality control programs may use this method. The harmless bacterial cultures in the lactic acid help protect against the growth of organisms that cause botulism. The rule retains the required 120 ppm nitrite level for plants not using the new alternative curing methods. The new regulations apply only to pumped bacon—the most common type produced—not to dry-cured bacon.

Red Tart Cherries: The Federal marketing order for red tart cherries expired August 31, 1986. In a referendum conducted March 10-20, 51 percent of the growers voting favored terminating the order. First established in 1971, the order limited the total quantity of cherries that handlers could freely move into commercial use. The remainder of the crop was frozen and set aside in grower-financed reserve pools during periods of overproduction.

Export Promotion: USDA has announced several targeted export promotion programs for U.S. agricultural products in accordance with the Food Security Act of 1985 *(table 1)*. These programs are designed to counter the adverse effects of foreign subsidies, import quotas, or other unfair trade practices on U.S. agricultural exports. □

Table 1. Targeted Export Promotion Programs: United States Takes An Aggressive New Stance

Program	Targeted markets	Reasons for promotion	Cost
Frozen potatoes	Japan, Hong Kong, Taiwan, Malaysia, and Singapore	Help U.S. potato industry, currently troubled by excess supplies and depressed prices.	$2 million
Arizona and California citrus	Pacific Rim (Japan, Hong Kong, Taiwan, Malaysia, Singapore, Korea, and New Zealand)	Offset adverse effects of the European Community's (EC) preferential tariffs and a retaliatory import duty imposed on U.S. lemons in November 1985.	75 percent of outlays during May-October 1986
Raisins	Western Europe and Pacific Rim countries	Counter adverse effects of EC subsidy and minimum import price system for Greek raisins.	$6.3 million
Walnuts	Western Europe and Japan	Offset EC retaliatory import duty imposed in November 1985.	$7 million
Canned peaches and fruit cocktail	Japan and Taiwan	Counter imports of subsidized EC products.	$2.5 million
Almonds	Western Europe, Japan, and Korea	Offset effects of restrictive import policies of Egypt and India, as well as EC export refund program.	50 percent of outlays during 1986/87 marketing year
Wine	Japan, United Kingdom, Hong Kong, and Singapore	Offset Japan's tariff and excise tax system, which restricts imports of U.S. wine; EC export subsidies; and restrictive import practices in potential markets.	$2.3 million
Dried prunes	Mainly Western Europe	Targeted at developing and expanding consumption in overseas markets.	$4 million
Florida citrus	Western Europe and Pacific Rim countries	Counter the impact of EC export subsidies and citrus tariffs on U.S. citrus, and Japanese and Korean import restrictions.	$4.6 million

Food and Nutrition Legislation

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Numerous food and nutrition bills have been introduced in the 99th session of Congress. Some of the legislation is described below.

Food Assistance

S. 2239—Sen. Jesse Helms (NC)

This bill, entitled the Food Stamp Cost Avoidance Act of 1986, would repeal several changes in the Food Stamp Program made by the Food Security Act of 1985, P.L.99-198 *(see NFR-33, p.32)*. Specifically, S. 2239 would make the following changes:

- Eliminate the requirement that States grant automatic food stamp eligibility to recipients of Aid to Families with Dependent Children (AFDC) or Supplemental Security Income (SSI).
- Repeal the increase in the earned income deduction—from 18 to 20 percent—that became effective May 1, 1986. This deduction compensates households for mandatory work-related expenses, such as taxes and union dues.
- Repeal the increase in the excess shelter deduction and the establishment of a separate limit on dependent care deductions. The 1985 Act estabilised a separate deduction for dependent care, at $160 per month, and raised the excess shelter deduction from $139 to $147 per month for the 48 contiguous States and the District of Columbia. The deductions for Alaska, Hawaii, Guam, and the U.S. Virgin Islands reflect their differing shelter costs.
- Eliminate the asset limitation increases for food stamp recipients. The 1985 Act raised the asset limit from $1,500 to $2,000 for nonelderly households and to $3,000 for households consisting of one elderly person.
- Repeal the requirement that the Secretary of Agriculture and the National Academy of Sciences conduct studies on the food stamp quality control system. Provisions

mandating a new control system, based on the studies' findings, would also be repealed.

- Freeze the funding levels for Puerto Rico's nutrition assistance block grant program at $825 million annually, thereby eliminating the scheduled increases for fiscal years 1987-90.
- Repeal the expansion of the Commodity Supplemental Food Program (CSFP). The 1985 Act allows additional sites for food distribution and participation by the elderly.
- Repeal the provisions that require State Cooperative Extension Services to expand food, nutrition, and consumer education programs for low-income persons.

The bill would also amend the Balanced Budget and Emergency Deficit Control Act of 1985 (P.L. 99-177), popularly known as Gramm-Rudman-Hollings. The Food Stamp Program; the Special Supplemental Food Program for Women, Infants, and Children (WIC); and child nutrition programs would be removed from the list of programs exempt from automatic spending cuts.

S. 2279—Sen. John Heinz (PA)

This bill is designed to standardize and improve the administration of the Temporary Emergency Food Assistance Program (TEFAP). S. 2279 defines three tasks First, States would be required to submit a annual plan to the Secretary of Agriculture outlining the distribution of surplus commodities to volunteer and emergency feeding organizations, including State efforts in training and technical assistance. Second, States would also have to submit quarterly reports on actual commodity inventories, al locations, and distributions. Third, the Secretary would issue regulations that estab lish standards for warehousing and storing commodities, State monitoring of commodi ty distribution by local organizations, and the liability of organizations for the loss of commodities. The bill would also reopen the Food Bank Demonstration Program, making food banks eligible to receive surplus USDA commodities.

S. 2495—Sen. Ted Kennedy (MA) and H.R. 4990—Rep. Leon Panetta (CA)

These identical bills, the Hunger Relief Act of 1986, would amend the Food Stamp Act of 1977, the Child Nutrition Act of 1966, and the National School Lunch Act t improve the benefits available under these programs. The bills would:

- Gradually increase the cost of the Thrifty Food Plan over a 4-year period and ultimately move to the Low Cost Food Pla as the basis for determining food stamp benefits. USDA issues four food plans. Th Thrifty Food Plan is the least expensive; th Low Cost Food Plan is the second least ex pensive.
- Raise the cap on the shelter deduction from $147 to $175. An increase from $147 to $152 is already scheduled for October 1986.
- Set the medical deduction for the elderl at 5 percent of gross income or $35, whichever is less.
- Raise the asset limit to $2,250 for nonelderly households and $3,500 for elde

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ly households. The limit for an automobile would increase to $5,500.

- Restore the Federal 50-percent matching funds for States who opt to provide food stamp outreach services—informing elderly, unemployed, and disabled people about the availability of food stamps.
- Exempt the first $50 a month paid in child support when determining eligibility and benefits. This would make the Food Stamp Program consistent with AFDC.
- Increase the Federal reimbursements for school breakfasts to help defray the costs of providing a nutritional meal. S. 2495 and H.R. 4880 would also increase the reimbursements for reduced-price meals, lowering the price for breakfast from 30 to 15 cents and lunch from 40 to 25 cents.
- Raise the reimbursement rate for breakfasts served in day care centers and family and group day care homes. One additional meal or snack per day would be provided through the Child Care Food Program.
- Increase WIC funding by $550 million over 3 years.
- Increase funding authorization for congregate and home-delivered meals, and nutrition education for the elderly. TEFAP funding authorizations would also be increased.
- Raise the authorization levels for the Expanded Food and Nutrition Program, the Community Food and Nutrition Program, and Nutrition Education Training in schools.
- Establish and implement a Coordinated National Nutrition Monitoring and Related Research Program. This section was originally introduced as H.R. 2436 (*see NFR-30, page 33 for a description*).

Food and Safety and Quality

S. 2446—Sen. John Chafee (RI)

The Fast Food Ingredient Information Act of 1986 would provide for ingredient labeling of food served in fast food restaurants. The Food, Drug, and Cosmetic Act; the Federal Meat Inspection Act; and the Poultry Products Inspection Act require that food sold in wrappers or containers have ingredient statements on the label. S. 2446 would make these laws applicable to fast food. If it is impractical to put the information on a label, lists of ingredients could be displayed on wall charts, food tray liners, or printed in brochures. The Secretaries of Agriculture and Health and Human Services would determine what is impractical. A fast food restaurant would be defined as one which is part of a chain of 10 or more franchised outlets.

H.R. 4683—Rep. Charles Stenholm (TX)

This bill, entitled the Processed Products Inspection Improvement Act of 1986, would allow USDA greater flexibility in allocating inspectors among meat processing establishments (e.g., canning, salting, packing, or rendering). USDA would determine the type and frequency of inspections for a particular establishment, taking into account the nature and volume of the processing operation, the reliability of processing controls and sanitation procedures, and the history of compliance with USDA regulations. Presently, USDA must always have an inspector on site when the plant is in operation.

H.R. 4762—Rep. Douglas Bosco (CA)

The Food Irradiation Safety and Labeling Requirement Act of 1986 would prohibit the Food and Drug Administration (FDA) from implementing its regulations relating to the irradiation of fresh foods. In April, FDA published regulations covering irradiation to inhibit sprouting and maturing and to rid the foods of insects (*Federal Register*, April 18, 1986). USDA and FDA would likewise be prohibited from implementing regulations relating to the irradiation of pork (*Federal Register*, July 22, 1985).

H.R. 4762 would require a study, conducted by the National Academy of Sciences, on the possible risks food irradiation presents to human health and the environment. The National Academy of Sciences would be required to provide a review of existing research on the safety and wholesomeness of consuming irradiated food. It also would be required to study the contamination of food by improper irradiation, the health risks to employees in food irradiation facilities and residents who live near such facilities, and the effects of transporting radioactive source material on the environment, population centers, and rural areas.

As do current FDA and USDA regulations, the bill would require irradiated food to carry a label stating this fact. The bill would go beyond FDA's regulations, however, by requiring that irradiated ingredients in foods also be identified on the label and that restaurants designate on their menus any foods that have been irradiated. Firms involved in irradiating foods would have to submit semiannual reports to FDA, which would then be available to the public. The report would contain a summary of the foods irradiated during the period (including quantities), for whom the work was done, and the dosages used. □

Food Spending and Income

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Americans spent $434 billion (seasonally adjusted at an annual rate) for food in the first quarter of 1986, 5.2 percent more than a year earlier *(table 1)*. Spending rose because of price increases, shifts to more expensive foods, added services, and larger purchases. After adjusting for inflation, food expenditures were up 3.6 percent from the first quarter of 1985.

Expenditures for food away from home continued to increase at a faster rate than for food at home. In the first quarter of 1986, spending for eating out was 6.2 percent above a year earlier, while outlays for food at home were up 4.8 percent. However, adjusted for price increases, which have been greater for restaurant meals, the rise in food spending away from home was only 2.3 percent, compared with 4.1 percent for food at home. The rise in real (inflation adjusted) spending for food at home was larger than recent years, partly because of increased spending for high-value prepared foods. These foods are being purchased in increasing quantities from the delicatessen, bakery, and frozen food departments of grocery stores.

Table 1. Food Expenditures Continue To Rise, But So Does Income

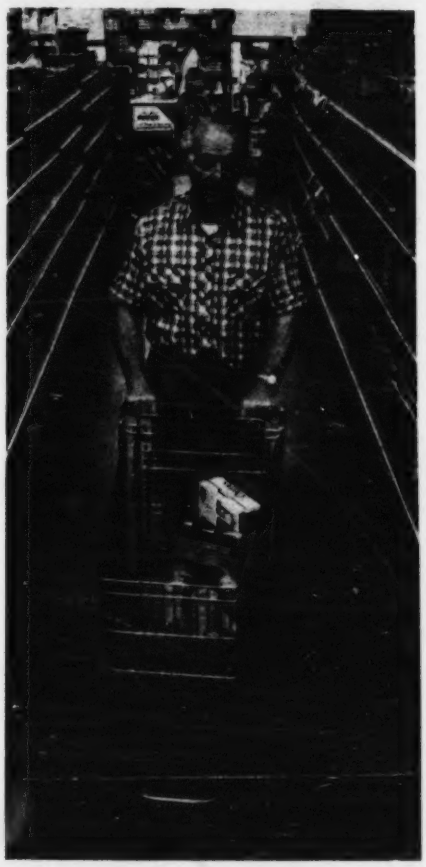
	Personal consumption expenditures for food[1]			Disposable personal income[1]
	At home	Away from home	Total	
	Billion dollars			
1985				
I	285.2	126.9	412.1	2,739.2
II	288.8	129.4	418.2	2,817.7
II	291.9	130.0	421.9	2,800.2
IV	296.5	131.7	428.2	2,845.9
1986				
I	299.0	134.7	433.7	2,893.4

[1]Seasonally adjusted at an annual rate.

Food's Share of Income Remains Stable

Although food expenditures increased, they continued to account for 15 percent of disposable personal income. The 5.6-percent rise in personal income, to $2,893 billion in the first quarter of 1986, was less than previous years, reflecting slower economic growth.

While the share of income spent on food recently has been stable, the portion of income spent on food has declined over the long term. Americans spent 16.5 percent of their income on food 10 years ago and 20 percent 25 years ago *(table 2)*. All of the decline occurred in spending for food at home, which dropped from 12.3 percent of disposable personal income in 1975 to 10.4 percent in 1985. At the same time, expenditures on food away from home rose from 4.2 to 4.6 percent.



Americans have spent less of their incomes on food and more on some other items. Outlays for services have risen considerably. They now absorb about 47 percent of disposable personal income, compared with 40 percent 10 years ago. Medical care and housing have grown significantly in the past 10 years. The portion of income spent on housing rose from 13 percent in 1975 to 14.4 percent last year. Medical care now takes 10 percent of personal income, up from 7.4 percent in 1975. Expenditures on recreation rose from 2.2 to 2.5 percent, and spending for personal business services, such as banking and legal services, grew to 5.7 percent, up from 4.6 percent. □

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Table 2. Share of Income Spent for Food Shows Long-Term Decline[1]

Year	Disposable personal income	Personal consumption expenditures for food			Proportion of income spent for food		
		At home[2]	Away from home[3]	Total	At home[2]	Away from home[3]	Total
		Billion dollars			*Percent*		
1950	207.5	36.6	9.4	46.0	17.6	4.5	22.2
1951	227.6	41.1	11.0	52.1	18.1	4.8	22.9
1952	239.8	43.1	11.6	54.7	18.0	4.8	22.8
1953	255.1	43.8	11.7	55.5	17.2	4.6	21.8
1954	260.5	45.0	11.5	56.5	17.3	4.4	21.7
1955	278.8	46.4	11.7	58.1	16.6	4.2	20.8
1956	297.5	48.3	12.1	60.4	16.2	4.1	20.3
1957	313.9	51.3	12.6	63.9	16.3	4.0	20.4
1958	324.9	53.9	12.7	66.6	16.6	3.9	20.5
1959	344.6	55.7	14.4	70.1	16.2	4.2	20.3
1960	358.9	56.6	15.2	71.8	15.8	4.2	20.0
1961	373.8	57.7	16.0	73.7	15.4	4.3	19.7
1962	396.2	58.2	17.1	75.3	14.7	4.3	19.0
1963	415.8	59.2	18.0	77.2	14.2	4.3	18.6
1964	451.4	62.7	19.1	81.8	13.9	4.2	18.1
1965	486.8	67.3	20.2	87.5	13.8	4.1	18.0
1966	525.9	73.2	21.5	94.7	13.9	4.1	18.0
1967	562.1	74.9	22.4	97.3	13.3	4.0	17.3
1968	609.6	80.3	24.9	105.2	13.2	4.1	17.3
1969	656.7	85.8	27.0	112.8	13.1	4.1	17.2
1970	715.6	92.9	29.6	122.5	13.0	4.1	17.1
1971	776.8	95.2	31.0	126.2	12.3	4.0	16.2
1972	839.6	101.5	34.0	135.5	12.1	4.0	16.1
1973	949.8	113.2	38.0	151.2	11.9	4.0	15.9
1974	1038.4	128.4	42.7	171.1	12.4	4.1	16.5
1975	1142.8	140.6	48.5	189.1	12.3	4.2	16.5
1976	1252.6	150.6	54.0	204.6	12.0	4.3	16.3
1977	1379.3	161.7	60.0	221.7	11.7	4.4	16.1
1978	1551 2	176.1	69.3	245.4	11.4	4.5	15.8
1979	1729.3	195.8	80.3	276.1	11.3	4.6	16.0
1980	1918.0	214.2	89.2	303.4	11.2	4.7	15.8
1981	2127.6	232.8	95.3	328.1	10.9	4.5	15.4
1982	2261.4	247.7	101.6	349.3	11.0	4.5	15.4
1983	2425.4	258.0	111.7	369.7	10.6	4.6	15.2
1984	2670.2	277.0	121.6	398.6	10.4	4.6	14.9
1985	2801.1	290.6	129.7	420.3	10.4	4.6	15.0

[1]Series revised by Department of Commerce back to 1929. [2]Includes food purchases for off-premise consumption and food consumed on farms where produced. [3]Includes purchased meals and beverages, excluding alcohol, and food furnished to the military and employees of hospitals.

Source: Department of Commerce, Bureau of Economic Analysis. Percentages compiled by USDA.

Recent Trends in Domestic Food Programs

Joyce Allen
(202) 786-1787

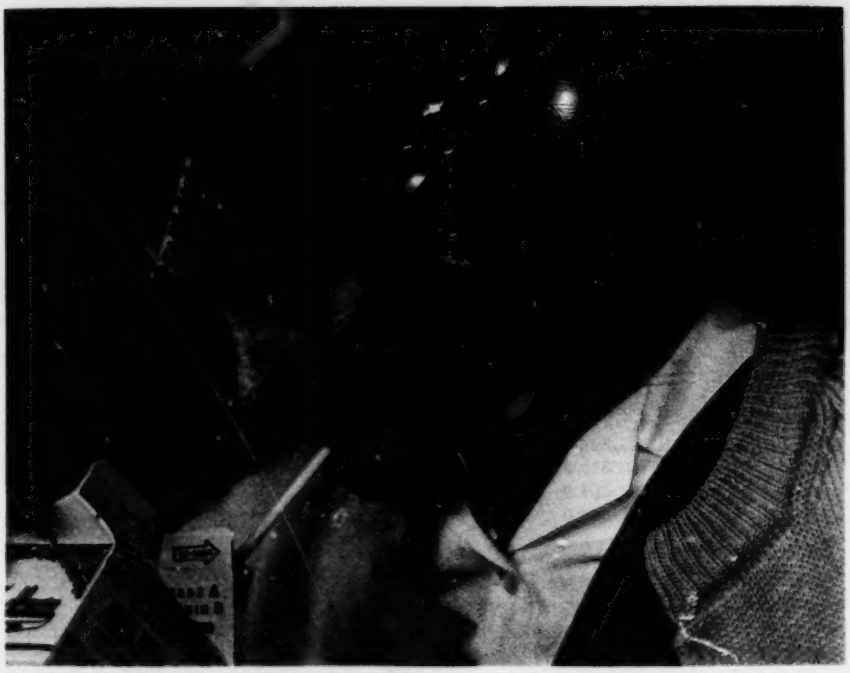
This article compares food program participation and costs for the January-March quarter of 1986 with the same 3 months of 1985. Preliminary data are reported as of May 1986 and are subject to revision. Entitlement and bonus commodities are included where applicable. Administrative costs are excluded unless noted.

Except for the Food Stamp Program (FSP), average participation in the USDA food programs either rose or remained constant during the first quarter of 1986 *(table 1)*. The number of food stamp participants declined by about 660,500. Monthly FSP benefits averaged $45.62 per person, compared with $45.35 a year earlier. Federal expenditures for food stamp benefits amounted to $2.7 billion in the first quarter of 1986 *(table 2)*, and the Federal share of administrative costs totaled $270.5 million.

Child Nutrition Programs

A daily average of 23.7 million students participated in the National School Lunch Program in the first quarter of this year, an increase of 0.5 percent. The average number of participants who received free and reduced-price lunches rose about 59,800 and 10,300, respectively, while the average number who paid the full price rose 64,000. During the first quarter of this year and last, free lunch recipients represented 42.6 percent of the total; reduced price, 6.7 percent; and full price, 50.6 percent.

Cash, entitlement commodities, and cash-in-lieu of commodities for the National School Lunch Program totaled $983.6 million in the first quarter of 1986, up from $954.1 million. In addition, schools received bonus commodities worth $123.2 million in the first quarter of 1985 and $118.7 million in the same period of 1986.



The number of half-pints of milk served under the Special Milk Program declined from 45.2 million in first-quarter 1985 to 43.1 million in the first quarter of this year.

The School Breakfast Program provided subsidized breakfasts to an average of 3.5 million participants per day in the first 3 months of 1986, a 1.9-percent increase from the previous year. Average participation among students receiving free and reduced-price breakfasts rose 2.1 percent, compared with 0.6 percent for those paying the full price for breakfasts. Federal expenditures rose 5.8 percent to $123.9 million.

An average of 57.3 million meals were served under the Child Care Food Program during the first quarter of 1986, an increase of 3.3 percent from a year earlier. Approximately 78.1 percent of the meals were served free in 1986, 5.7 percent at reduced prices, and 16.2 percent at the full price. Meal costs and the value of commodities used in meal preparation increased 5.6 percent, from $109.4 million to $115.5 million.

The author is an agricultural economist with the Food and Agricultural Policy Branch of the National Economics Division.

Table 1. Average Participation in USDA Food Programs

Program	Jan.-Mar. 1985	Jan.-Mar. 1986
	Millions	
Food Stamp Program	20.4	19.7
National School Lunch Program	23.6	23.7
School Breakfast Program	3.4	3.5
Special Supplemental Food Program for Women, Infants, and Children (WIC)	3.1	3.3
Nutrition Assistance Program in Puerto Rico	1.5	NA
Child Care Food Program[1]	1.1	1.1
	Thousands	
Commodity Supplemental Food Program	139.2	141.0
Elderly Feeding Pilot Project	19.5	19.6
Food Distribution Program on Indian Reservations[2]	140.0	146.3
Nutrition Program for the Elderly[1]	826.8	858.3

[1]Average daily attendance in March. [2]Includes needy families in Trust Territories. NA = Not available.

Source: Data from the Food and Nutrition Service.

The total number of half-pints of milk served under the Special Milk Program declined from 45.2 million in the first quarter of 1985 to 43.1 million. Federal expenditures totaled $4.2 million in the first quarter of 1986, compared with $4.3 million the previous year.

Supplemental Food Programs

The Special Supplemental Food Program for Women, Infants, and Children (WIC) and the Commodity Supplemental Food Program (CSFP) serve the same general population. WIC is available nationwide, whereas the CSFP currently operates in 12 States and the District of Columbia. Persons may not participate in both programs simultaneously.

Average participation in WIC rose 5.8 percent, from 3.1 million persons per month to 3.3 million. In the first quarter of 1986, children accounted for 50.4 percent of the participants; infants, 28.4 percent; and women, 21.3 percent. Food costs totaled $318.7 million, a 6.8-increase from the first quarter of 1985.

The CSFP served an average of 141,000 persons per month in the first quarter of 1986, an increase of 1.3 percent. The distribution of participants in 1986 was: children, 65.7 percent; women, 19.3 percent; and infants, 15 percent. Food costs fell from $9.7 million to $8.3 million, largely reflecting a decline in the value of bonus commodities.

Average participation in the Elderly Feeding Pilot Project (which operates under the auspices of the CSFP) increased 0.6 percent to 19,600 persons. Food costs for the projects were $534,300 in the first quarter of 1986, compared with $544,000 a year earlier.

Food Distribution Programs

Participants in the Food Distribution Program on Indian Reservations received food worth $12.8 million in the first quarter of 1986, a 4-percent increase from the previous year. Participants include Native Americans and needy persons in the Trust Territories. Approximately 97 percent of the 146,300 participants in the first quarter of 1986 either lived on or near reservations.

Average daily attendance at centers participating in the Nutrition Program for the Elderly rose 3.8 percent to 858,290 persons. During the period, Federal expenditures increased from $33.1 million to $34.9 million. About 90 percent of the assistance was in cash.

Food valued at approximately $206.8 million was distributed under the Temporary Emergency Food Assistance Program in the first quarter of 1986, down from $260.1 a year earlier. This decline is largely due to a reduction in the amount of cheese that was distributed—from 120.6 to 101.5 million pounds. The program provides food to the needy while reducing Government stocks of surplus commodities. □

Table 2. Federal Cost of USDA Food Programs[1]

Program	1983	1984	1985[2]	1985[2](Quarters) I	II	III	IV	1986[2] I
				Million dollars				
Family Food								
Food Stamps	11,119	10,673	10,704	2,771	2,691	2,580	2,662	2,697
Nutr. Asst. Prog. in Puerto Rico[3]	825	825	825	206	206	206	206	206
Food Distribution								
Food Distribution on Indian Reservations	36	43	49	12	12	12	12	13
Schools[4]	821	828	851	273	159	144	275	270
Other[5]	229	225	201	45	56	59	41	50
Temporary Emergency Assistance[6]	1,106	1,057	908	260	253	189	206	207
Cash in lieu of Commodities[7]	126	133	142	36	35	35	36	36
Child Nutrition[8]								
School Lunch	2,443	2,552	2,608	807	644	327	831	835
School Breakfast	357	378	391	117	99	51	124	124
Child Care Food and Summer Food Serv. Prog.	407	454	499	101	119	173	106	108
Special Milk	17	16	16	4	4	4	4	4
WIC[9]	1,194	1,417	1,512	368	375	382	387	396
Total[10]	18,680	18,601	18,706	5,000	4,653	4,162	4,890	4,946

[1]Calendar years. Administrative costs are excluded unless noted. [2]Preliminary. Quarterly data may not add to annual total due to rounding. [3]Puerto Rico transferred from the Food Stamp Program to a substitute nutrition assistance program on July 1, 1982. Includes special projects expenditures. [4]National School Lunch, Child Care Food, Summer Food Service programs and commodity schools. [5]Commodity Supplemental Food Program, Elderly Feeding Pilot Project, Nutrition Program for the Elderly, and donations to charitable institutions.[6] Initiated December 1981. [7]Child nutrition programs and the Nutrition Program for the Elderly. [8]Cash expenditures. [9]Special Supplemental Food Program for Women, Infants, and Children. Includes administrative costs. [10]May not add due to rounding.

Source: Data from the Food and Nutrition Service.

In the News...

Food Manufacturing Sees Wave of Mergers

Mergers are transforming the food manufacturing industry. Between January 1977 and December 1985, 118 of the 500 largest food manufacturers (as of 1976) had been acquired in mergers. Mergers occur often in the U.S. economy, but unusually intense merger "waves" have appeared only four times over the last 100 years. By some measures, the current wave is the largest, exceeding the conglomerate merger wave of the late 1960's.

Three features distinguish the current merger wave in food manufacturing. First, many individual transactions are "blockbuster" mergers, with some of the largest firms being acquired. For example, Nestle acquired Carnation for $3 billion, R.J. Reynolds paid $4.9 billion for Nabisco Brands, and Phillip Morris acquired General Foods for $6 billion.

Second, many recent large mergers joined firms that produce related consumer products, in contrast to the conglomerate character of many mergers during the late 1960's. Agricultural commodity firms like Cargill and Archer-Daniels-Midland have expanded into related grain and oilseed processing, transportation, and storage activities.

Finally, firms now often divest divisions acquired in previous mergers. In fact, in recent years, divestitures have often been as numerous as acquisitions, although the average value of divestitures is still smaller. Many nonfood companies have sold their food manufacturing operations. Prominent examples include IT&T's sale of Continental Baking to Ralston Purina and RCA's sale of its Banquet Foods subsidiary to ConAgra.

For more information, contact James MacDonald, (202) 786-1864.

Convenience Stores Show Rapid Growth

Convenience stores, long known for their limited high-volume food and nonfood products and extended hours, have grown rapidly by including such items as self-service gasoline and self-service fast food. In addition to self-service, a number of convenience store retailers have installed limited-menu food service, often with customer seating as well as carryout.

At $14.1 billion, gasoline sales constituted 41 percent of convenience store sales in 1985, up from 7 percent in 1975. Fast food sales totaled $2.2 billion, a 50-percent gain from 1975.

The number of convenience units increased from 26,600 in 1974 to 45,400 in 1985, with their share of grocery store sales rising from 4 to 12 percent. Although convenience stores are still experiencing real (adjusted for inflation) growth, the rate of increase has slowed in recent years.

For more information, contact Phil Kaufman, (202) 786-1866.

Food Marketing—Contributing to the Economy

There are over a million establishments within the overall food marketing system, including more than 250,000 retailers, about 700,000 foodservice operations, about 40,000 wholesalers, and 16,000 food processors.

The food marketing system is one of the largest industries in the Nation in terms of employment, generating approximately 12 million full-time equivalent jobs and employing more than 1 out of every 10 U.S. workers. These include over 3½ million workers in retailing, wholesaling, and transportation; over 1½ million in food processing; and 3½ million in eating and drinking places. The food marketing system generates another 3½ million jobs through other supporting sectors, such as packaging, advertising, and energy.

For more information, contact Charles Handy, (202) 786-1866.

HFCS Use in Soft Drinks May Register Smaller Increases

For several years now, high fructose corn syrup (HFCS) has been replacing sugar in soft drinks. However, early estimates for 1986 indicate the trend may be leveling off because the soft drink industry has almost finished making the switch. Last year may have been the final year for a high growth rate. Total HFCS use rose 21 percent to 5.2 million tons in 1985. Domestic sugar use fell more than 5 percent to 7.6 million tons. Any further growth for HFCS would have to come from an expanded overall market, and not from a bigger share of the existing market.

HFCS accounts for 30 percent of total sweetener use, up from 4 in 1975. Noncaloric and low-calorie sweeteners share of the market doubled to 12 percent of the total following the introduction of aspartame in 1981. Relatively high sugar prices and a more acceptable taste than previous noncaloric sweeteners led to much of the gain.

For more information, contact David Harvey, (202) 786-1769.

U.S. Monthly Agricultural Trade Balance in Deficit

The United States' agricultural trade balance in May went into the first monthly deficit since 1971. The deficit totaled $146 million, after the previous 7 months of the fiscal year averaged a surplus of $715 million. Extremely low exports, high coffee import prices, and delays in reporting previous months' import data were behind this shift.

Low exports give greater weight to shifts in imports that would ordinarily have little

or no chance of moving the balance into deficit. May imports, at $2 billion, were record-high, fueled by coffee prices which have been as much as $2.50 a pound this year, the highest since 1977. Also, vegetable imports in May were reportedly $164 million higher than a year earlier, mainly because of increased shipments of fresh tomatoes from Mexico.

Despite this first recorded deficit in fifteen years, the U.S. farm trade balance is expected to average a $600 million monthly surplus for the year. During the previous 5 fiscal years, the monthly surplus averaged $1.65 billion a year.

For more information, contact Stephen MacDonald, (202) 786-1621.

Beverage Container Deposit Law Reduces New York Litter

Take a walk or drive and you're bound to see bottles, cans, and other waste tossed by the side of the road or in parks. Beverage containers alone account for 20 to 30 percent of the pieces of litter collected by roadsides and in parks. By volume, that's 40 to 60 percent.

In response to this problem, New York has become the newest and the ninth State to enact a beverage container deposit law. While the specific provisions of the laws vary by State, they have the same basic premise—consumers who purchase certain beverages leave a deposit that is refunded when the bottle or can is returned to an established distribution site (usually the local supermarket). In New York, beer, soda, and mineral water drinkers receive a minimum of 5 cents for each empty container they return.

New York recently took a look at the effectiveness of its law 1 year after enactment. A State commission on returnable beverage containers found that litter was 70 percent less in New York than in Pennsylvania, which doesn't have such a law. Solid waste tonnage declined by 3 to 5 percent a month, yielding a monthly savings of 5 to 8 percent in landfill space. Statewide container return rates were about 70 percent for soft drinks and 86 percent for beer.

For more information, contact Doris J. Newton, (202) 786-1866.

USDA Offers New Electronic Information Service

A new electronic service provides USDA information on food and nutrition and tells how to reach Department specialists. The system carries information on topics such as the dietary guidelines, food economics, and food safety. The service also lists bibliographies and announces upcoming activities and programs.

For more information on this service, call Lillie Vincent, (202) 447-8157. For information on how to electronically access this service, call (202) 488-0550.

Rice Bran Could Yield New Foods

Rice bran may yield new foods high in vitamins, minerals, protein, and fiber. Rice bran contains about 20 percent oil, which deteriorates, making the bran inedible. However, USDA scientists have discovered an economical process that prevents this deterioration. Scientists ran the bran through a machine that created enough heat to destroy enzymes that break down the oil. What are left are edible bran and an oil rich in vitamin E.

The deterioration of rice bran had concerned world food experts for 25 years. Now, rice bran oil could be used as a major cooking oil in developing countries where rice is a staple. In this country, the technique is stimulating development of products such as new breakfast cereals.

For more information, contact Robin M. Saunders, (415) 486-3296.

Calcium Increases Storage Life of Pears

Calcium sprayed on pear trees helps the fruit stay fresh longer. Just as calcium helps humans develop strong bones and teeth, it helps build strong cell walls in Anjou pears. Strong cells make pears less prone to spongy spots and an ugly skin browning called scald, both of which shorten storage life. USDA researchers say that growers can also get more calcium into pears by pruning excess growth early in summer, applying less nitrogen fertilizer, and irrigating less.

For more information, contact J. Thomas Raese, (509) 662-4317. □

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Provisions of the Food Security Act of 1985, by Lewrene K. Glaser. AIB-498. April 1986. 116 pp. $5.50. Order SN: 001-019-00461-4.

The Food Security Act of 1985 will guide U.S. agricultural policy for the next 4 years. This new report summarizes the Act's provisions for USDA's commodity, trade, nutrition, and conservation programs, among others. It compares the 1985 Act with previous legislation and summarizes the Food Security Improvements Act of 1986.

U.S. Demand for Food: A Complete System of Price and Income Effects, by Kuo S. Huang. TB-1714. December 1985. 60 pp. $2.00. Order SN: 001-019-00433-9.

A complete matrix of all direct, cross-price, and expenditure elasticities for 40 food items and one nonfood item. The estimated demand system examines the interdependent nature of demand for foods in terms of prices and income.

U.S. Demand for Food: Household Expenditures, Demographics, and Projections, by James R. Blaylock and David M. Smallwood. TB-1713. February 1986. 56 pp. $2.25. Order SN: 001-019-00436-3.

Measures the effects of income and other demographic factors on per person spending for 28 food groups and alcoholic beverages. The results are combined with projections for income, age distribution, regional population shifts, racial mix, and population growth to project food spending to the year 2020.

U.S. Demand for Food: Household Expenditures, Demographics, and Projections
Implications of World Sugar Markets, Policies, and Production Costs for U.S. Sugar
Cooperative Over-Order Pricing of Fluid Milk
Economies of Size in Hog Production

Specialty Grocery Wholesaling: Structure and Performance, by Walter B. Epps. AER-547. March 1986. 24 pp. $1.00. Order SN: 001-019-000435-5.

Specialty grocery merchants sell more food at wholesale than any other group of wholesale vendors, according to this benchmark study of the industry. The typical specialty grocery merchant is a supplier of perishable food who runs a low-volume wholesale operation with few employees, handles one product line, supplies particular customers, trades with other wholesale vendors, and offers specialized services. Although these establishments predominate, changes in marketing, such as processors selling directly to retail clients, may reduce the demand for specialty services.

Food Marketing Review. AER-549. March 1986. 60 pp. $3.00. Order SN: 001-019-00455-0.

Sales in the U.S. food marketing system in 1985 reached an estimated half a trillion dollars and grew faster than the gross national product. The food marketing system comprises more than 1 million firms in food manufacturing, wholesaling, retailing, and service and employs more than 1 out of every 10 U.S. workers. The current status and outlook for these firms, workers, and the food marketing system as a whole are examined in this publication.

Implications of World Sugar Markets, Policies, and Production Costs for U.S. Sugar, by Frederic L. Hoff and Max Lawrence. AER-543. November 1985. 44 pp. $1.75. Order SN: 001-019-00424-0.

Analyzes production costs of 56 sugarcane producing countries and 26 sugarbeet producing countries to determine the conditions under which total world sugar production has expanded since 1981, despite low prices. Most major sugar producing and exporting countries have adopted national policies to protect domestic producers from periodic price depressions.

Economies of Size in Hog Production, by Roy N. Van Arsdall and Kenneth E. Nelson. TB-1712. December 1985. 100 pp. $3.50. Order SN: 001-019-00417-7.

Discusses economies of size in hog production: inputs and costs; investments in depreciable assets; returns; income taxes; and physical, price, and economic performance measures in the North Central and Southeast regions, the major U.S. hog producing areas.

An Analysis of Cooperative Over-Order Pricing of Fluid Milk, by Edward V. Jesse and Aaron C. Johnson. TB-1708. August 1985. 52 pp. $2.00. Order SN:001-019-00401-0.

Focuses on what over-order premiums represent, whether they monopolize milk markets through dairy cooperatives, or whether they are a means of achieving competitive pricing in Federal milk marketing orders. Identifies factors likely to influence the level of over-order premiums and estimates their individual and combined effects.

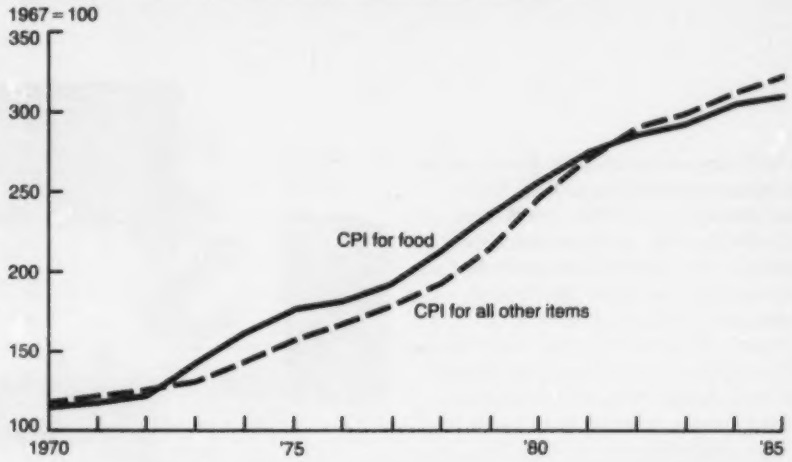
Dietary Guidelines and Your Diet. June 1986. 52 pp. $4.50. Order SN: 001-000-004467-2.

Set of the first seven bulletins that supplement *Nutrition and Your Health: Dietary Guidelines for Americans*. Each bulletin focuses on one of the seven dietary guidelines, providing suggestions for their implementation. Second set to be published in 1987. □

Food and Commodity Prices

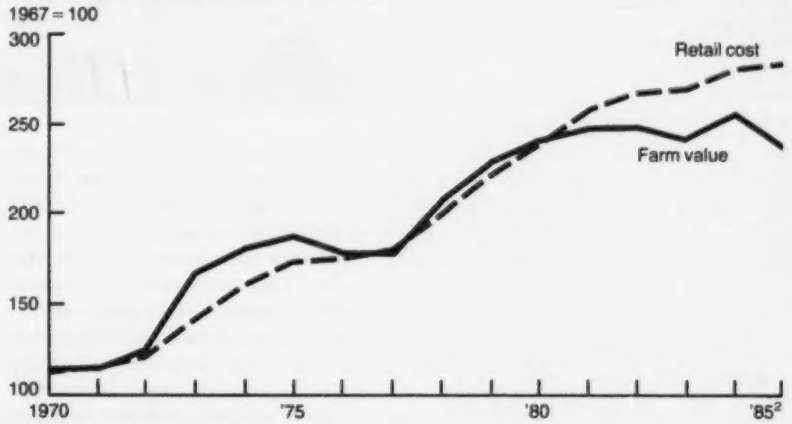
The Consumer Price Index (CPI) for food in 1985 almost tripled its 1970 level. The CPI for food measures retail prices of imported food items, as well as those produced on U.S. farms. Between 1970 and 1985, retail prices for food increased at approximately the same rate as other consumer items.

Retail Food Prices Rose at Nearly Same Rate as Other Items



The retail cost and farm value of USDA's market basket of farm-produced foods have both more than doubled since 1970, with especially large increases in 1973 and 1974, and again in 1978. However, because of depressed farm prices over several years, the 1985 farm value was only 15 percent above 1978. Meanwhile, retail food prices rose 42 percent. The 1985 farm value fell 7 percent from a year earlier, while retail prices rose slightly more than 1 percent.

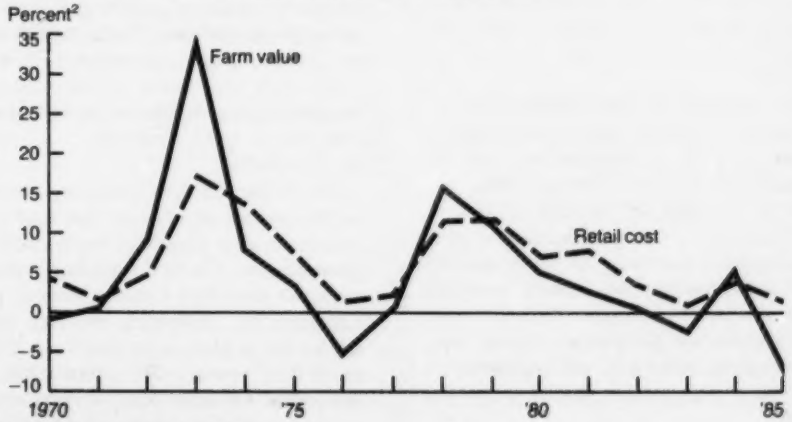
Rise in Retail Cost Outpaces Farm Value[1]



[1]Market basket of farm-produced foods.
[2]Preliminary.

The farm value of food fluctuates more sharply than retail value, because farm prices are affected by supply disruptions caused by weather, pests, and variable costs for fuel and livestock feed. In contrast, marketing costs rely heavily on labor costs that are often fixed by contracts and container and packaging costs. As a result, marketing costs have risen consistently since 1970, but the annual changes have varied.

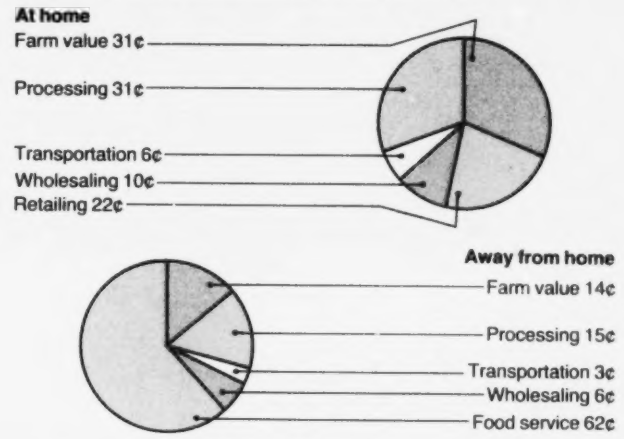
Farm Value Fluctuates More Than Retail Cost of Food[1]



[1]Market basket of farm-produced foods.
[2]Year-to-year change.

The 1985 farm value totaled 31 cents of the at-home food dollar but only 14 cents of the away-from-home dollar. Food service accounted for 62 cents of the away-from-home food dollar, overwhelming all other costs. The at-home food dollar posted a more even split.

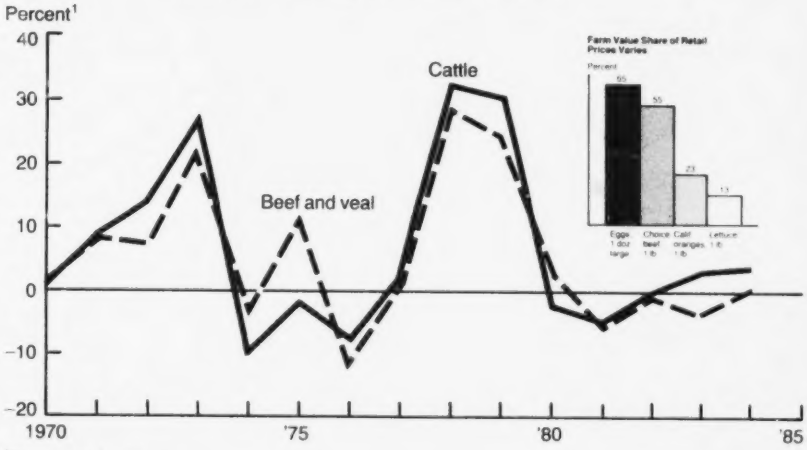
Where the Food Dollar Went at Home and Away in 1985



Source: *Food Costs. . .From Farm to Retail*, by Denis Dunham, Economic Research Service, March 1986.

The influence of the farm and marketing components of retail prices can be more clearly seen by examining individual commodities. Beef and veal, for example, illustrate how closely retail prices can follow swings in farm value when marketing costs form a relatively small portion of consumer costs. Farm value accounted for 55 percent of the retail price of 1 pound of Choice beef in 1985. In contrast, the share for lettuce was 13 percent.

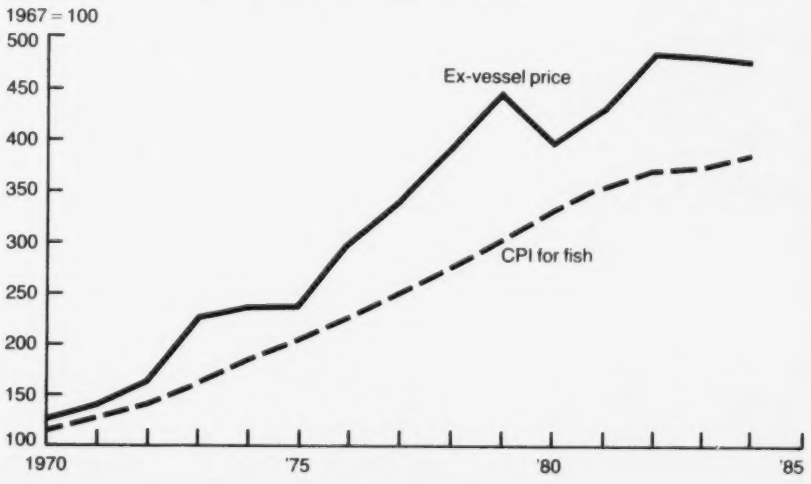
Retail Beef and Veal Prices Closely Track Cattle Prices



[1]Year-to-year change.

In contrast to farm-produced foods, growth in the price fishermen received (the ex-vessel price) outpaced the retail price of fish during 1970-84. The ex-vessel price has risen because of increasing consumer demand and the relatively fixed supplies of the major fish species. Processing costs have also trended upward, but at a slower rate. Because they comprise a larger share of the retail price of fish, slower growth in marketing costs has dampened the rise in retail fish prices.

Fishermen's Price Rose Faster Than the Retail Price



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The Food Industry: Changing With the Times

1980's

1970's

1960's

1950's

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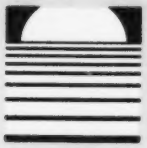
The Food Industry: Changing With the Times



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Food Marketing—From Farm to Table

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Food marketing—two words that encompass a wide range of activities that transform Indiana corn into breakfast cereal or Iowa beef into a fast food meal. Over 1 million establishments make up the food marketing system, including over 250,000 retailers, about 700,000 foodservice establishments, 40,000 wholesalers, and more than 16,000 processors.

The food marketing system is rapidly changing, affected by shifts in the population, consumer lifestyles, and health concerns, as well as by the industry's attempts to stimulate demand for agricultural products.

For Firms, It's Fewer but Larger

Food processing, wholesaling, and retailing firms, like most other major industries, have experienced a sharp decrease in numbers in recent years. The number of food manufacturing firms, for example, declined from more than 40,000 in 1947 to 20,616 in 1977, to 16,813 in 1982. Meanwhile, wholesalers dropped by nearly half *(table 1)*.

Although the firms are fewer, they're larger. And this has had implications for large firms' shares of sales. The 50 largest food processing companies, for example, accounted for over 43 percent of U.S. shipments from all food processing establishments in 1982, compared with 35 percent in 1967.

In an expanding market for wholesaler services, the 50 largest general-line firms (handling a variety of groceries, household products, and health and beauty aids) increased their national share of wholesale food sales from 48 to 64 percent between 1972 and 1982. The 50 largest specialty wholesalers (handling perishable lines such as frozen foods, fish, and fresh fruit) also increased their share from 26.5 to 34 percent. Only limited-line wholesalers—who carry dry groceries such as canned foods, coffee, tea, spices, bread, and soft drinks—lost shares.

Although no food retailers are national, a handful of very large firms account for a significant share of total industry sales. The 20 largest food retailers accounted for 27 percent of grocery store sales in 1948 and 34 percent in 1958. Since 1958, however, their share has increased negligibly, reaching just 35 percent in 1982.

The Nation's largest foodservice firms—those that dispense prepared meals and

Table 1. Fewer But Larger Firms Dominate Food Marketing Sector

	1967	1972	1977	1982
Manufacturers		*Number*		
Firms	26,549	22,171	20,616	16,600
Outlets[1]	32,517	28,193	26,656	21,316
Share of value added, firms:		*Percent*		
1-50 largest	35	38	40	43
51-100 largest	13	13	12	13
101-200 largest	9	10	11	11
201-500 largest	10	11	11	10
All others	33	28	26	23

	1972			1977			1982		
Wholesalers	*Number of top firms*								
	4	8	50	4	8	50	4	8	50
	Percent of sales								
General line	9.9	16.2	47.5	15.0	22.4	56.6	17.4	26.5	63.6
Limited line	10.4	21.7	42.3	13.3	19.5	46.6	9.0	13.8	37.2
Specialty	7.2	10.9	26.5	10.3	15.1	33.5	14.9	20.9	34.0

	1948	1954	1958	1963	1967	1972	1977	1982
Grocery chains	*Percent of sales*							
Four largest	NA	20.9	21.7	20.0	19.0	17.5	17.4	16.1
Eight largest	NA	25.4	27.5	26.6	25.7	24.4	24.4	23.6
Twenty largest	27.0	29.9	34.1	34.0	34.4	34.8	34.5	34.9

[1]Firm may own more than one outlet.

This article was based on a larger study written by Anthony E. Gallo, James M. MacDonald, Walter B. Epps, Phillip R. Kaufman, Judith J. Putnam, Harold R. Linstrom, Michael G. Van Dress, Charles R. Handy, and Lester Myers of the Food Marketing and Consumption Economics Branch of the National Economics Division.

snacks for on-site or immediate consumption—have increased their share of sales gradually over time. However, there is still not a significant concentration of sales among the largest firms. The four biggest foodservice firms, for example, accounted for only 5 percent of 1982 total foodservice sales, compared with 4 percent in 1972. The 50 largest firms comprise just 20 percent of foodservice sales, up from 13 percent in 1972.

Food Marketing: Contributing to the Economy

Food marketing is an important contributor to the Nation's economy. In 1984, it accounted for $386 billion of the gross national product (GNP)—about 10.5 percent of the total.

The food marketing system as a whole, however, has shown relatively slow growth compared with other sectors of the economy. On the production side, its contribution to the GNP rose at a yearly compound growth rate of 1 percent between 1976 and 1984, while the nonfood marketing sector's rose 1.6 percent. Rising incomes in recent years meant consumers have allocated a smaller share of income to food and more to nonfood purchases. Consequently, the food system's share of GNP fell from about 11.5 percent to roughly 10.5 percent. Employment by the food sector fell from 11.6 to 10.6 percent.

The food marketing system is one of the largest employers in the Nation, generating approximately 12 million full-time jobs and employing more than 1 of every 10 U.S. workers.

The food marketing system is one of the largest employers in the Nation, generating the equivalent of approximately 12 million full-time jobs and employing more than 1 of every 10 U.S. workers *(table 2)*. These include over 3.5 million workers in retailing, wholesaling, and transportation; over 1.5 million in food processing; and 3.5 million in eating and drinking places. The food marketing system generates another 3.5 million jobs through other supporting sectors, such as packaging, advertising, and energy.

The food-away-from-home sector, having experienced phenomenal growth in the last several decades, is an increasing source of employment. About 2.1 million or 8 percent of the 25.6 million new jobs that the U.S. economy is expected to generate during 1982-95 should occur in foodservice, according to projections by the Bureau of Labor Statistics (BLS). Foodservice employment was conservatively estimated at 6.2 million, and BLS projections call for about a 33-percent increase by 1995.

Table 2. Food Marketing System One of Nation's Largest Employers

	1976	1978	1980	1982	1984	1976	1978	1980	1982	1984
Full-time equivalent employment	*Millions*					*Percent*				
Food Sector	11.2	11.5	12.2	12.0	12.0	11.6	11.2	11.4	10.9	10.6
Processing	1.5	1.5	1.6	1.6	1.4	1.6	1.5	1.5	1.4	1.2
Retailing and wholesaling	2.9	3.0	3.2	3.2	3.2	2.9	2.9	3.0	2.9	2.8
Transportation	.4	.4	.4	.4	.4	.4	.4	.4	.4	.4
Eating and drinking places	3.0	3.1	3.3	3.2	3.4	3.1	3.0	3.1	2.9	3.0
Other supporting sectors	3.4	3.5	3.7	3.6	3.6	3.5	3.4	3.5	3.3	3.2
Nonfood sector	85.0	90.8	94.7	98.2	101.5	88.4	88.8	88.6	89.1	89.4
Civilian labor force	96.2	102.3	106.9	110.2	113.5	100.0	100.0	100.0	100.0	100.0

Source: Lee, Chinkook, Gerald Schluter, William Edmondson, and Darryl Wills.

Measuring the Size of the U.S. Food and Fiber System. Forthcoming staff report. U.S. Department of Agriculture, Economic Research Service.

Growth in Eating Out Likely To Continue

Demographic projections from the U.S. Census Bureau also suggest continued growth in the away-from-home sector through the end of the decade. The percentage of the total population between 25 and 44 years old—those most frequently eating out—may increase 4 to 5 percentage points during 1980-90. Another category of frequent diners, one-person households, may rise from 23 percent of the total population in 1980 to about 25 percent by 1990. On a per-capita basis, one-person households spend 89 percent more than the average household for food away from home, while two-person households spend 29 percent more than average. One- and two-person households should constitute around 57 percent of all households by 1990, up from 54 percent in 1980.

Further increases in the number of women in the labor force should also enhance the prospects of the food-away-from-home industry and influence the marketing of many food products and services. In 1984, 53 percent of women 16 years or older were in the labor force, up from 43 percent in 1970 and 34 percent in 1960. Nearly 7 in 10 women age 20 to 44 years are now in the labor force. If most of these women remain in the labor force, and if succeeding generations of women participate at equal or higher rates, the number of working women will increase into the first decade of the next century.

The portion of the total U.S. population in the Northeast and Midwest should fall from 47.7 percent in 1980 to 39.6 percent by 2000. This means almost 6 of every 10 Americans could be living in the South and West by the end of this century. These projected regional shifts could mean greater opportunities for foodservice growth in the South and West and could influence national food purchase and consumption patterns. Cajun-type fried chicken, southern biscuits, oriental stir-fry dishes, and Mexican specialties, for example, are already popular in every major region and could continue to grow with the population shifts. Meanwhile, opportunities for expansion should continue in the Northeast and Midwest, since population density will remain relatively high despite slower growth (and even moderate declines).

Increases in consumer income, after adjusting for inflation, should spawn additional foodservice growth. Studies have found that a 10-percent increase in consumer income results in a 5.5- to 11.6-percent rise in meals and snacks away from home, assuming other factors remain constant. Using the midpoint of this range, ERS economists forecasted the impact of changes in income on foodservice growth from 1984-94. They found that a 10-percent rise in income could mean an 8.5-percent rise in spending for meals and snacks. If inflation-adjusted (real) per capita disposable income rises 18 percent and population almost 10 percent, real sales of commercial eating places could rise 25 percent from 1984-94. However, the average compound annual increase of 2.3 percent during the period will be below the 3 percent rate of 1977-84. Changes in the age and geographic distribution of the population, household size, consumer preferences, and improved marketing and merchandising efforts could further enhance growth.

Continuing efforts to contain the Federal budget will restrain foodservice sales in the noncommercial sector. This might create lucrative markets for commercial firms capable of providing efficient, cost-saving foodservice to such institutions as hospitals and schools, which traditionally run in-house feeding operations.

Want More Information On Food Marketing?

Food Marketing Review, 1985, the first annual report on this important economic sector, details the firms comprising the processing, wholesaling, retailing, and foodservice industries. The future of the firms, workers, and the system as a whole are examined.

Food Marketing Review, 1986 will be published in early 1987. These reports may be purchased from the Superintendent of Documents, U.S. Government Printing Office (GPO), Washington, D.C. 20402. Order *Food Marketing Review, 1985* by title and stock number 001-019-00455-0. The price is $3.00 domestic, $3.75 foreign. Stock number and price information for 1986 version of the report will be available early next year. Make check or money order payable to the Superintendent of Documents, or call GPO at (202) 783-3238 to charge your purchase to your VISA, Choice, MasterCard, or GPO Deposit Account.

The Battle for the Food Dollar

For all sectors of the marketing system, competition for the food dollar should increase in the decade ahead. Food marketers are experimenting with new formats, merchandising strategies, and improved food products and services to satisfy an older, better educated, more diverse, and demanding population.

Nowhere will the competition be more keen than in the food-away-from-home sector, as an array of outlets try to capture more of this rapidly growing market. The fast food industry, for example, has moved in several new directions to build its market share. It is operating outlets in new locations, such as schools and college campuses, hospitals, military bases, toll roads, bus terminals, retail stores, shopping malls, central city office buildings, recreational sites, and international markets. Menus now include such items as salad bars, salad entrees, pasta dishes, baked potatoes, gourmet burgers, more fish and chicken items, soups, fruit juices, and whole grain buns.

Many foods have been added in response to demand from health- and diet-conscious individuals. The diet-conscious segment of restaurant menus has expanded as the scientific base linking diet and health mounts and as women, who are joining the labor force in large numbers, eat out more often.

Many fast food outlets have upgraded their decor and added driveup windows to attract more business. These outlets have also introduced breakfast and dinner specialties, extended operating hours, and estab-

lished a niche in the catering business to get full use of equipment and increase unit sales.

Many full-service restaurants are experimenting with lighter dishes and emphasizing freshness, quality, regional cooking, and seasonality to increase customer traffic. Compared with fast food places, these restaurants enjoy greater flexibility to adapt menus and preparation methods quickly to meet changing consumer preferences. Some full-service establishments are launching gourmet takeout foods to boost sales and expand the customer base.

Eating places, however, face competition from other areas of food retailing, with the microwave oven figuring prominently in the competition. Grocers, stepping up the battle for market share, are stocking more upscale frozen foods ready for heating in a microwave. Forty-two percent of U.S. households had microwave ovens in 1985, up from 13 percent in 1980. Campbell Soup Company estimates that microwave ovens will be in 70 to 80 percent of all homes by the year 2000. Convenience stores, with increasingly heavy investment in microwave ovens and other foodservice equipment, are also rapidly expanding foodservice sales. Fast food sales were up 50 percent from 1975, reaching 6.1 percent of their total sales in 1984 *(table 3)*.

Food retailers are also responding to the growing popularity of convenience and prepared foods by installing salad and soup bars, adding in-store bakeries and delicatessens, and providing cut and prepared produce. Some supermarkets now also offer in-store restaurants.

Table 3. On-the-Go Consumers Boost Convenience Store Sales

	Total	Non Gasoline[1]	Gasoline
	Billion dollars		
1971	3.6	NA	NA
1972	4.2	NA	NA
1973	5.1	NA	NA
1974	5.3	4.9	0.4
1975	6.2	5.5	.7
1976	7.4	6.3	1.1
1977	8.9	7.4	1.5
1978	10.6	8.7	1.9
1979	14.1	10.5	3.6
1980	18.9	12.4	6.5
1981	22.8	14.1	8.7
1982	25.4	15.1	10.3
1983	28.3	16.5	11.8
1984	34.0	19.7	14.3

NA = Not available. [1]Food and general merchandise.

Source: National Association of Convenience Stores. *State of the Industry Report.* 1984 and previous years.

A Look Ahead At Wholesaling and Retailing

While retailers attempt to expand into the away-from-home market, wholesalers are moving into the food store business, resulting in a profound change in food distribution. About 3 percent of the 10,000 retail food stores served by the leading wholesalers in 1984 were wholesalers' corporate stores. Wholesalers have long acquired supermarkets where chains have left the area; they also buy independents. Wholesalers usually resell acquired supermarkets to independent operators. However, they have also retained some facilities and remodeled them to test prototypes of retail food stores.

Increasingly, the leading wholesalers are building larger stores, many of which are superwarehouse stores. Combining the scale of warehouse stores and the decor and variety of supermarkets, these giants involve capital outlays on a scale accessible only to operations with substantial retained earnings or extensive credit lines. The great volume required to sustain profitability also means drawing on a customer base extending up to 25 or 30 miles, and sometimes drawing customers away from other retailers supplied by the wholesaler.

For large wholesale firms, superwarehouse stores provide the means to increase profitability of the parent firm. Whether owned or licensed, warehouse stores of 50,000 square feet or larger generate tremendous wholesale volume.

In the decade ahead, we are likely to see more wholesaler-owned large retail stores as general-line firms attempt to expand. Large wholesalers will likely increase their volume through owning retail stores in growing areas and licensing independent retailers where ownership may involve competing with the wholesalers' other retail customers. Wholesaler expansion will also occur as firms continue to enter new geographic areas by acquiring local or regional distributors.

In addition, independent retailers will continue to grow, reopening former chain stores in central cities. Independents have competed aggressively and successfully with chains by offering personalized service, su-

pervising their operations closely, and receiving vital support from their wholesalers. The independents' success favors the continuing operation of those wholesalers who accept small orders, deliver frequently, and otherwise service low-volume retailers.

Despite the growth in independents, the trend toward fewer but larger supermarkets will probably continue. Grocery store capacity (sales, adjusted for inflation, as well as square footage of selling area) is still expanding, as many smaller supermarkets are replaced by superstores with 35,000 to 55,000 square feet of selling area and by superwarehouse stores and other large hybrid store formats, ranging from 45,000 to 200,000 square feet. In addition to potential size economies, these larger operations allow greater merchandising and ordering flexibility through delivery of many products direct from the manufacturer. The number of convenience stores has grown more than 40 percent since 1977, with a continuation of this trend expected.

The Outlook for Food Manufacturing

Clearly, where and what *(see article on page 6)* we eat in the decade ahead will shift dramatically. However, big changes also loom on the horizon for those who produce and market our food.

Foreign investment in U.S. food industries grew between 1976 and 1982, then stabilized. Thirty foreign firms entered the United States during that period (and 18 firms, smaller than the entrants, left, for a net gain of 12 firms). These 12 helped raise the share of U.S. food manufacturing employment held by foreign firms from 3 to 4.2 percent in just 6 years. Although foreign firms still constitute a small share of the U.S. food industry, they have the capacity to grow further.

The Nation's economy is becoming more international as real (adjusted for inflation) shipping and communications costs fall, and as incomes and tastes in foreign industrialized countries more closely approximate those here. Over the next 20 to 30 years, those trends should lead to steady increases in foreign investment in the United States and in U.S. investment overseas. Nevertheless, the pace of foreign investment in U.S. food industries has slackened in the last 4 years, after rapid growth during 1979-81, when a relatively low-valued dollar reduced stock prices of U.S. firms relative to foreign companies. The strong dollar of 1982-85 then reduced foreign acquisitions, even during a rising U.S. merger wave. With the dollar declining on foreign exchange markets in 1985 and 1986, the pace of foreign investment in the United States may begin to pick up.

Typically, foreign firms enter U.S. industries that are important in their home countries, where the firms have gained expertise. The largest entrants, accounting for 60 percent of employment in foreign-owned firms, are from the United Kingdom and are diversified producers of consumer food products. That is, they tend to be marketing-oriented firms. Cultural similarities, especially in language, and similar production and marketing techniques probably explain the large British presence. Firms from several other countries rapidly expanded their U.S. holdings in a few industries. For example, French firms expanded their small share, chiefly in dairy products (yogurt and cheese) and wines, both large domestic industries in France.

Japanese firms expanded rapidly during 1976-82, largely in fishing industries where they process some of the catch from U.S. coastal waters for the Japanese market. Firms such as Mitsui, Sugiyo, and others have also introduced a variety of new surimi products to U.S. markets. Surimi are seafood analogs that allow low-value, widely available fish, such as pollock, to be marketed in forms that simulate the color, texture, and flavor of higher priced items, such as king crab. A drastic decline in the king crab catch since 1980 has led to widespread use of surimi-based crab analogs.

Many U.S. firms have opted to expand their operations by diversifying into other industries. Data show that some firms among the 50 largest in food manufacturing acquired even more food operations between 1976 and 1982. In total, the 50 largest food manufacturers participated in 435 food manufacturing industries in 1982, a 7.4-percent gain from 1976.

Major food manufacturers also expanded their interests in agriculture and in service-producing industries outside of manufacturing. The 50 largest food manufacturers increased their holdings of nonmanufacturing industries 15 percent between 1976 and 1982.

The key issue is whether firms that diversify can reduce costs. That is, will a single firm that produces in five industries have lower costs than five separate firms, one in each industry? The evidence is far from clear. However, if diversification reduces costs, it can have far-reaching effects on the industry. It will increase productivity growth, but it will do so in part by driving many small specialized firms from the industry. New entry and new products will come almost exclusively from existing diversified firms rather than new ones. What's more, the share of the food industry held by the largest firms may rise sharply. □

Meat, Poultry, and Dairy: What Does the Future Hold?

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The mix of animal products we eat has changed significantly in the last three decades. Today, it's more chicken, turkey, beef, and cheese, and less pork, butter, and eggs *(table 1)*. Even the types of meat and dairy products we eat are different. For example, shoppers can purchase brand-name poultry, choose their favorite parts, and even select pan-ready items.

What's more, the decade ahead is likely to bring more changes. Technological advances will mean a host of new products in the meat counter and dairy case. With little increase in overall consumption of animal products expected in the next decade, the beef, pork, poultry, and dairy industries will try to capture a larger share of a stagnant market by offering more higher profit processed products. Furthermore, industry structure is likely to change because of this slow-growing market. Beef producers, for instance, may follow the lead of their poultry counterparts and assume more functions from farm to retail.

Explaining Three Decades of Change

A host of factors explain the changes in consumption of animal products, including growing incomes, new production and marketing technologies, and shifts in consumer preferences.

On the production side, the poultry industry has clearly been a leader in making physical and organizational improvements and in passing these benefits on to consumers. Improved productivity has enabled the poultry industry to produce and market chicken, turkey, and eggs at prices that have not risen as fast as overall consumer prices or prices of production inputs, such as labor, feed, and energy *(see NFR-23)*. A 1983 report by the Economic Research Service (ERS) estimated that, in the absence of technological advances, the retail price for chicken would have been $1.30 a pound in 1981—56 cents above the actual retail price. Similarly, improvements in producing and processing turkeys meant that consumers paid only 93 cents a pound in 1981, instead of the $1.77 that would have been necessary to cover the costs of production under 1960 technology.

Spurred by cost-savings at the farm and processing levels, per-pound retail prices for poultry have remained well below those of red meat products *(figure 1)*. The Consumer Price Index shows that while retail pork, and beef and veal prices climbed about 190 percent between 1962 and 1985, poultry prices rose a comparatively modest 112 percent. In 1985, consumers paid, on the average, 76 cents a pound for broilers and $1.05 a pound for whole turkeys. Retail Choice beef prices, in contrast, averaged $2.33 a pound, and pork was $1.62.

Nevertheless, better production practices have also helped hold the line on costs in the beef and pork industries. Gains in efficiency have kept retail increases for beef and pork below what they would have been in the absence of industry changes, helping maintain consumer demand for these products over the last 20 years.

The story isn't much different in the dairy industry. Fewer but more productive milk cows are now supplying more than consumer needs. The number of cows declined from almost 22 million in 1950 to 11 million in 1985. At the same time, there was a significant increase in output per cow, from about 5,300 pounds in 1950 to over 13,000 in 1985—a 145-percent gain. Production per cow rose 26 percent just since 1975. Better producing cows pushed milk output from 117 billion pounds in 1950 to 144 billion in 1985.

Increases in milk supplies, however, have come in the face of relatively constant aggregate demand. Increases in population from 1950 to 1985 have been largely offset by decreases in per capita consumption, from 341 pounds in 1950 to 243 pounds in 1984 (product-weight basis).

Table 1. Americans Ate Less Whole Milk, Eggs, and Butter, and More Chicken, Turkey, and Lowfat Milk in 1985

	1950	1985
	Pounds per capita	
Fluid milk (product weight)		
Whole milk[1]	298.0	123.0
Lowfat milk[2]	31.6	113.2
Cream and specialties	11.8	7.3
Total	341.4	243.5
Butter	10.7	4.9
Margarine	6.1	10.7
Cheese		
American	5.2	12.0
Other	2.2	9.7
Total	7.4	22.4
Red Meat		
Beef	50.1	78.6
Veal	7.3	1.8
Pork	64.4	62.0
Lamb and mutton	3.6	1.5
Poultry		
Chicken	20.6	57.4
Turkey	4.1	11.9
Eggs (number)	389.0	255.0
Fish and seafood	11.8	14.5

[1]Includes flavored milks. [2]Includes lowfat, skim, buttermilk, and yogurt.

Marketing—Meeting Consumer Needs

Clearly, the animal products industries made tremendous strides by increasing output with fewer resources. At the same time, changes in marketing have had implications for the foods we buy.

Take turkey, for example, which was once largely a seasonal product, available primarily in the fall. Turkey's graduation to year-round eating was prompted by a rapid increase in the use of further-processed turkey products beginning in the mid-1960's. At the end of the decade, about 25 percent of the volume was sold to shoppers as frozen raw meat in roasts, dinners, and pies

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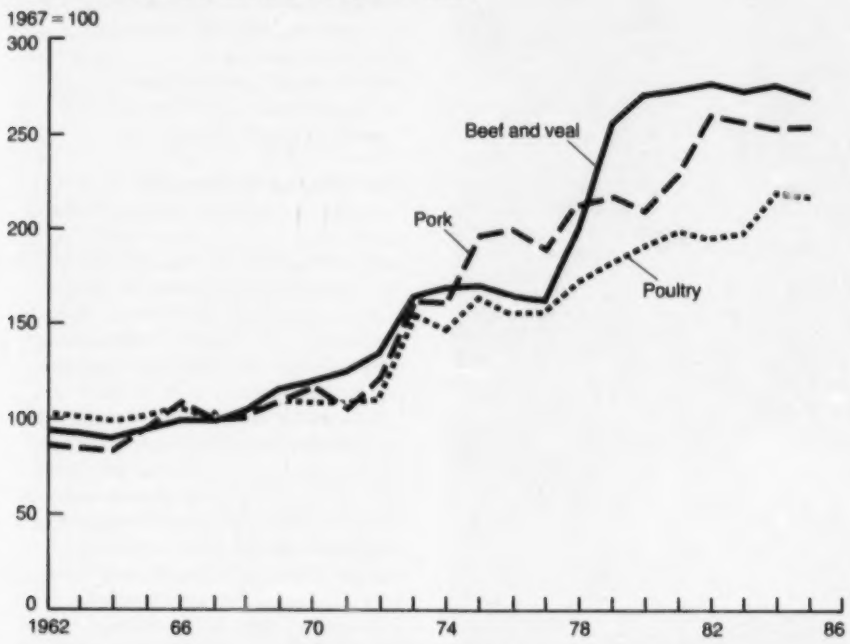
Figure 1. Beef and Pork Prices Outpace Poultry



and to institutions as cooked turkey rolls. By the early 1980's, a variety of new consumer products, such as turkey ham, salami, and other less traditional forms, claimed over 40 percent of the market.

Apparent in the broiler industry is the shift to cut-up birds. A shopper in 1950 would likely have bought a whole bird simply labeled with the store name. Today, consumers can choose among many major advertised brands, and they can select only their favorite parts. Branded whole or cut-up broilers and turkeys now make up a significant portion of poultry sales. However, consumers are paying more for a "name" bird—about 10 cents more a pound in the case of at least one producer.

Consumers are also willing to pay more for convenience, prompting a wave of value-added products. Precooked poultry products, such as vacuum-packaged barbecue turkey and turkey roasts, are marketing successes. Holly Farms, Perdue, and other poultry producers are also offering more "upscale" raw products, such as boneless breasts and chunks to appeal to consumers' desires for convenient, time-saving foods. Boneless chicken, in fact, is becoming increasingly common, accounting for 15 percent of all chicken products marketed last year, up from 5 percent before 1980. The proliferation of pan-ready products has helped boost chicken and turkey's popularity with consumers.

The greater variety of products also means poultry is making in-roads in traditional red meat markets. To appeal to consumers concerned about fat, processors have begun marketing chicken or turkey franks, turkey breakfast sausage, and turkey salami and ham. In fact, in a 1985 survey of consumer attitudes conducted for the American Meat Institute (AMI) and the National Livestock and Meat Board (NLMB), 34 percent of the respondents reported that they bought chicken more often because more varieties of products were sold.

The trend to value-added poultry products differs from the more commodity-oriented beef industry. For poultry, most of the value added is at the producer level, reflecting the industry's extensive vertical integration (single firms raising, processing, and marketing birds). In contrast, trimming or special cuts of beef are generally done by the retailer.

However, restaurants and other foodservice outlets have been demanding more precut and portion-controlled red meat items. Foodservice firms tend to use meat products that have already been cut, trimmed, weighed, individually wrapped, and in some cases, even cooked.

With "upscale" the watchword in the food industry these days, even the dairy industry has jumped on the bandwagon. The dairy case reveals a range of products designed to appeal to more diverse tastes. Yogurt, for example, comes in a wide variety of textures and flavors. One firm is currently advertising its yogurt as "so rich you can eat it for dessert," hoping to carve out another niche for its product.

Like the poultry industry, dairy processors have moved to more value-added products. Shredded cheese is available in packages, for example, for cooks in a hurry. Cheeses with Mexican flavorings and spices are also a growing trend, along with a host of cream cheese flavors, such as strawberry, peach, or onion. One cooperative, Land O' Lakes, has broadened its product line to include an upscale time-saving product—pourable quiche.

Convenience and Nutrition Affect Consumer Choices

In the 1985 AMI/NLMB study of consumer attitudes, convenience was cited as an important consideration in consumer purchasing. Respondents expressed a greater concern about limiting the time and effort devoted to meal preparation.

Health concerns were also up substantially from a previous AMI/NLMB study in 1983. Sixty-eight percent of the 1985 respondents strongly agreed that it is important to limit fat in the diet, compared with 57 percent

Spurred by cost-savings at the farm and processsing levels, per-pound retail prices for poultry have remained well below those of red meat.

just 2 years before. Those voicing extreme concerns about salt totaled 53 percent, up from 46 percent in 1983, and cholesterol was cited by 45 percent, versus 39 percent.

A 1984 national survey by the Food Marketing Institute indicated that many Americans feared that some of the chemicals used in producing, processing, and preserving foods were not safe. What's more, they claimed that they avoided buying products they believed to be risky.

This growing health and safety awareness has, of course, been cited as one factor driving changes in consumption patterns. Medical evidence suggesting a correlation between consumption of foods high in saturated fats and increased risk of heart disease and obesity has led some consumers to choose poultry over red meat, skim milk over whole, and margarine over butter.

However, the link between health concerns and changes in dietary patterns is not completely clear. A study of household garbage by a University of Arizona archeologist finds apparent conflicts in consumer eating habits. On the one hand, the amount of meat fat discarded by a sample of Tuscon households rose from about 3.5 grams per household per day in 1979 to around 7 grams in 1985. Furthermore, there was a decrease in purchases of red meat with separable fat. At the same time, however, there was an increase in purchases of ground beef, hot dogs, lunch meats, sausages, and bacon—the largest contributors to fat in the American diet, according to the Department of Health and Human Services' Health and Nutrition Examination Survey II. The Arizona study suggests that a desire for convenience may explain the increase in these sources of nonseparable fat. The answer, too, may lie in the problem of "visible" versus "invisible" fat.

Cost Still the Bottom Line

Despite the desire for greater convenience and growing concerns about health and the safety of food, research reveals that the major economic determinants of demand—price of the product, price of substitutes and complements, and consumer incomes—are more important in determining consumer purchasing patterns.

Between 1965 and 1985, real (adjusted for inflation) per capita disposable income rose 50 percent, leading to an increase in total per capita meat consumption and helping to maintain the demand for beef. Red meat purchases are fairly responsive to changes in income, rising about 0.7 percent for each 1-percent change in income, according to a 1982 ERS study. Beef is more sensitive to income changes than pork.

There is research evidence, however, that the average consumer is becoming less reponsive to both changes in income and prices. The 1982 ERS study compared price and income responsiveness for a wide range of meat items in 1965 with the same items in 1977. For virtually every meat, the consumer reponse was smaller in 1977 than in 1965. The report concluded that consumer preferences for meat and meat items consumed at home may be declining, especially with respect to lower priced ones. Loin and rib steaks, chicken parts, and other poultry and shellfish were among the few items for which the amount spent in response to a change in income increased between the two surveys.

Higher per capita incomes have also meant a boost in away-from-home eating. Eating away from home increased from 28 percent of food expenditures in 1962 to over 43 percent in 1985, with fast food outlets getting a growing share. The traditional

fare of hamburgers and roast beef at fast food outlets helped maintain the demand for beef. A 120-percent increase in the number of full-menu steak franchises also contributed.

Many outlets also began offering chicken. Between 1973 and 1985, the number of franchise establishments primarily selling chicken rose 81.5 percent, while those selling primarily hamburger and roast beef increased 48 percent.

Looking Ahead to the Next Decade

With an understanding of the factors influencing consumer eating patterns, what about the future? ERS recently looked at how income and demographic changes may affect American food spending. The rate of growth in national food expenditures through 1995 may not be much different from the rate for 1965-80. However, two factors—higher incomes and an older population—could mean significant shifts in expenditures among food groups. Combining population growth with income growth and the aging of the population could mean an almost 32-percent national increase in expenditures for fish between 1980 and 1995, a 24-percent rise for beef, and a 22-percent gain for poultry. Dairy products are expected to rise about 20 percent and eggs, 17 percent *(for more detail, see NFR-32)*.

The ERS estimates do not account for the impact of the trend toward more value-added products. Following the poultry industries' lead, the beef industry is likely to abandon its traditional commodity orientation in favor of more value-added products. If the strategy is adopted, even greater expenditures may be expected for meat and poultry products in the decade ahead.

But what about the amount we'll be eating? While meat and poultry consumption grew from 164 pounds in 1955 to 211 pounds in 1985, the rate of growth has slowed. Our appetites for meat and poultry increased at an average of 1.4 percent annually in the 1950's and 1960's, but declined 0.5 percent a year during the first half of the 1980's.

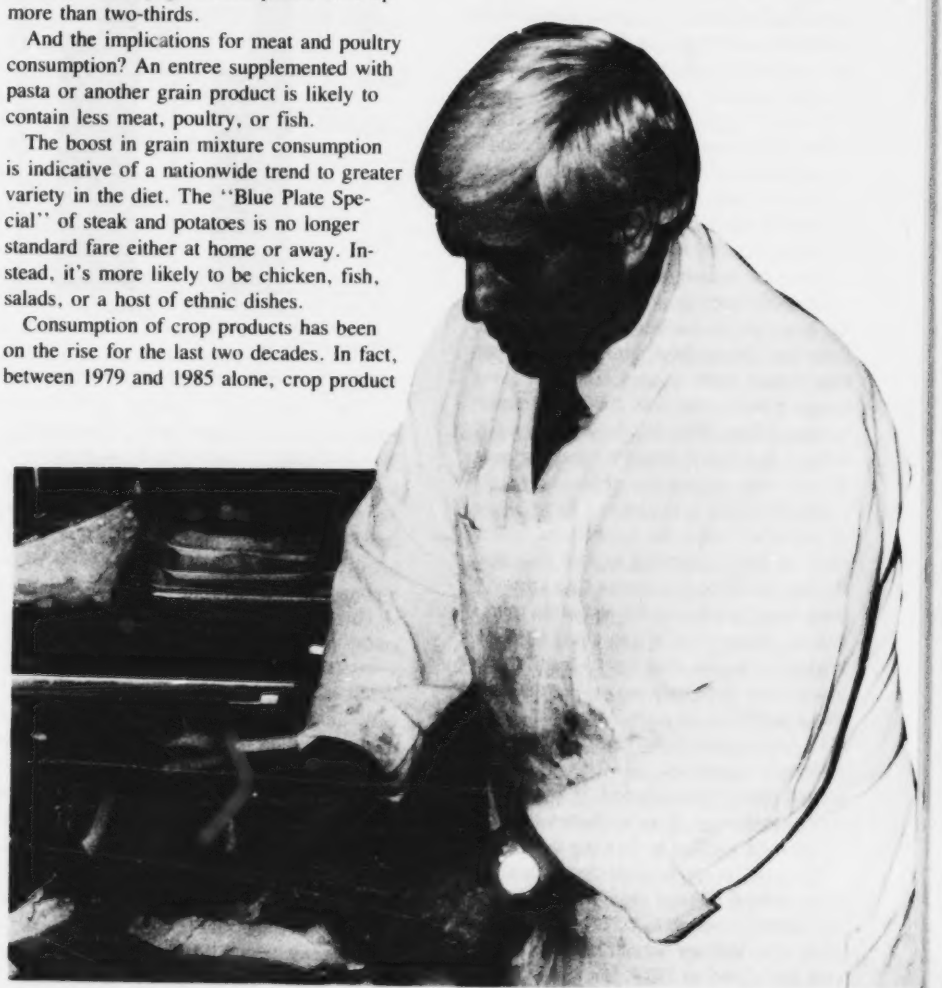
Continuation of the trend to slower growth in total per capita meat and poultry consumption is reinforced by several factors. USDA's recent Continuing Survey of Food Intakes by Individuals, initiated in 1985, indicates a growing preference by women and their children ages 1 to 5 for food as mixtures of two or more ingredients. Women ate an average of one-third more meat, poultry, and fish mixtures than in 1977—mainly in such forms as stews, sandwiches, and frozen entrees. Grain mixtures, such as spaghetti and pizza, were up more than two-thirds.

And the implications for meat and poultry consumption? An entree supplemented with pasta or another grain product is likely to contain less meat, poultry, or fish.

The boost in grain mixture consumption is indicative of a nationwide trend to greater variety in the diet. The "Blue Plate Special" of steak and potatoes is no longer standard fare either at home or away. Instead, it's more likely to be chicken, fish, salads, or a host of ethnic dishes.

Consumption of crop products has been on the rise for the last two decades. In fact, between 1979 and 1985 alone, crop product consumption rang up a 12-percent increase. At the same time, total animal product consumption increased less than 4 percent, largely due to a drop in milk, milk products, and eggs.

With the overall level of the meat consumption not expected to increase dramatically, we are likely to see continued shifts in the shares of consumption. During 1960-64, red meat accounted for almost 75 percent of total meat, poultry, and fish consumption. Its share is currently about 66



For the beef industry, trimming, special cuts, or other value-added services are generally done by the retailer.

percent. At the same time, poultry's share has jumped from about 19 to 27 percent.

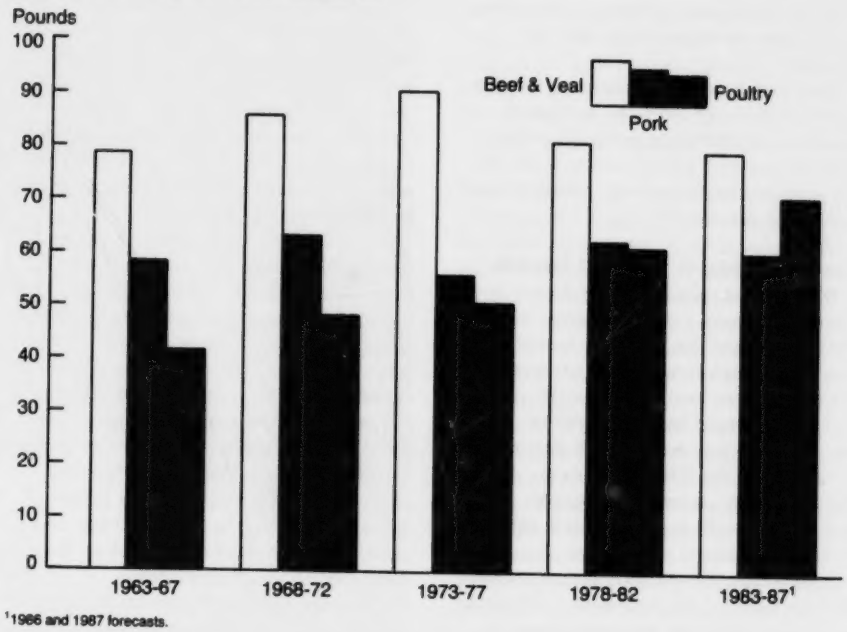
The fish industry's impact on total consumption also cannot be ignored. Indeed, fish consumption has grown from 11.8 pounds per person in 1950 to almost 14 pounds in 1984. Once regarded as being too difficult and time-consuming to prepare, the development of convenience products, such as frozen seafood dinners, breaded shrimp, and prepared fish cakes, has encouraged consumers to include more seafood in their diets. What's more, improvements in preparing and marketing processed seafood products, such as frozen fish fillets, have also spurred growth in seafood restaurants and other outlets.

Increased consumption of seafood in the United States may be further stimulated by technological advances. New production techniques, such as aquaculture, and new processing methods, including simulated seafood products, hold the promise of increasing the quantity and quality of seafood while moderating prices. Economists with the National Marine Fisheries Service estimate that fish could climb to almost 8 percent of total meat, poultry, and fish consumption by the year 2000, up from 7 percent during 1960-64. A slow rise admittedly, but one that means a shrinking pie for red meat and poultry producers.

Poultry is likely to continue to be a gainer and could claim the number one spot as early as 1987, according to ERS estimates. Poultry has already surpassed pork by 7.3 pounds and trails beef by just under 10 pounds *(figure 2)*. Chicken alone lags behind pork by less than 5 pounds. ERS estimates show per capita poultry consumption rising to almost 79 pounds by 1987—about a 12-percent gain from 1985. Beef consumption, in contrast, is expected to slip to second place with a total of 73.6 pounds, a 7-percent decline. Pork is predicted to drop 6.5 percent to 58 pounds a person.

The story becomes even clearer looking at the annual rates of change in beef, pork, and poultry consumption. Beef consumption grew at an average annual rate of 1.5 percent from 1965 to 1975. But from 1976 to 1985, it declined 1 percent a year. Chicken, in contrast, has shown almost continual growth, rising from 2.6-percent a year to 3.6 percent annually. Pork increased at about 0.39 percent for the first 10 years, but gained 2 percent from 1976-85. An 8-pound per person gain in 1979, however, significantly, raised the average annual increase for pork for 1976-85.

Figure 2. Poultry Gains on Red Meat



[1]1986 and 1987 forecasts.

What Will Be on Store Shelves?

While we'll be much more likely to sit down to a chicken dinner in the decade ahead, what about the types of meat, poultry, and fish products we'll find at the store? Value-added will continue to be the name of the game. Value-added products meet consumer demands for greater convenience while ensuring greater returns and new growth opportunities for the producer or processor. Hormel, for example, known for its canned meat products, has already begun charting an aggressive growth strategy that involves a range of value-added products, from frozen entrees to nonmeat items, such as barbecue sauce and salads. With fish a potential big gainer, Hormel has also acquired the Farm Fresh Catfish Co., Inc.

This continuing shift to value-added could have significant implications for the beef and pork industries in particular. Further processing means a smaller share of the consumer's meat dollar for slaughtering plants—a fact the beef and pork industries have not failed to notice. It suggests that we may see greater vertical integration by those industries in an attempt to capture additional revenue, greater market control, and hopefully increased profits.

Marketers are likely to continue responding to the clear signal from consumers—make it light, lean, and convenient, even if it costs more. Continued efforts by the National Cancer Institute to encourage lower consumption of the foods associated with cancer means concerns about fat are proba-

bly more than a passing trend. As a result, such retail giants as Kroger and Safeway are already trimming more. Indeed, some industry analysts suggest that completely trimmed meat may not be too far off in the future. The question then becomes how will this filter back to the farm level? Store buyers are likely to want packers to trim more, meaning that packers will increasingly want to buy leaner cattle. As a result, the industry already has an eye towards leaner breeds of cattle.

At least two poultry producers have already responded to the call for leaner products and are currently marketing a lower fat chicken. The new Perdue chicken contains an average of 21 percent less fat, Holly Farm's 14 percent.

The growing trend toward lowfat products as supplements to traditional lines suggests that market segmentation will be an often-used competitive tool. Products will be increasingly offered for segments of the population concerned about fat, salt, sugar, and others. Looking at the dairy case, for instance, you'll find Kraft's Philadelphia Cream Cheese and it's lowfat counterpart. The notion of segmentation is already surfacing in the meat industry, as stores offer lean or extra lean products, along with Choice cuts.

With additives also a concern, the meat industry is looking at products free of these. In response to concerns about antibiotics in beef, organic meat is already being marketed. Grand Union Co. recently became the first U.S. supermarket to offer "natural beef"—free of synthetic or chemical additives. It is now available in more than 300 Grand Union stores in 11 Eastern States. The natural beef appears to be a marketing success, showing steady sales growth despite its 40-cent to $2.00 per pound higher price tag. Indeed, natural beef may bode well for the industry, as sales of the new product take some from regular beef but also attract consumers who previously shunned red meats.

To encourage more red meat in the Nation's diet, beef and pork producers are financing research and promotion programs. Beef producers will pay $1 per head of cattle marketed and pork producers, ¼ to ½ percent of the market value of hogs or pork. These programs follow the lead of the dairy industry's product promotion, research, and nutrition education program intended to reduce milk supplies and increase consumption of milk and dairy products. The dairy industry spent over $60 million for a national advertising and promotion effort.

Looking ahead for the dairy industry, we find bovine growth hormone (bGH) and a host of other technological advances looming on the horizon *(see article on p. 12)*. The bGH, isoacid nutritional supplements, computerized feeding equipment, embryo transfer techniques, and other technologies promise greater productivity at the farm level.

At the same time, analysts see dim prospects for growth in the demand for dairy products beyond that consistent with population increases. The future for dairy products is clouded somewhat by an aging population that doesn't drink as much milk and a growing proportion of blacks, who generally cannot tolerate the lactose in milk. Contributing, too, are the increased concerns about fat and calories and stiff competition from other beverages, particularly soft drinks. The proliferation of imitation products, notably coffee whiteners and cheeses designed to address consumer concerns about fat and calories, may also play a role.

On the other hand, the growing sophistication of the population in the area of nutritional knowledge means dairy products are increasingly being perceived as wholesome and nutritious. The proliferation of milks with different fat content has helped change public perception of how fattening milk can be. Reduced-calorie counterparts for items such as sour cream, cream cheese, and cheese may also maintain or encourage greater consumption by some groups. Increased awareness of the importance of calcium and growing concern about osteoporosis may boost dairy consumption among women—one group with traditionally low intake.

Finally, one magazine, *Restaurants and Institutions*, recently launched a campaign aimed at promoting the use of dairy products away from home. This is a growth area because, traditionally, consumption of dairy products away from home has been confined to cheese and butter. □

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Bovine Growth Hormone Brings Progress to Dairy Farms

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The union of biology and technology is propelling agriculture into a new era of advancement. Biotechnology—the use of living organisms to modify existing products—could mean large gains in the variety, quality, production efficiency, and output of food before the turn of the century.

The dairy industry, policymakers, and many consumer groups are currently taking a hard look at one of the emerging biotechnologies, bovine growth hormone (bGH). A naturally occurring protein hormone, bGH could mean sizable gains in milk output per cow. In an industry already burdened by overproduction relative to consumption, the adoption of this and other innovations will lead to further gains in productivity and continued adjustments both in the dairy sector and Federal policies over the next several decades.

A Century of Technological Advances

Technological innovation is nothing new to the dairy industry. At the beginning of the 1900's, the development of a simple test to measure butterfat content and commercial adoption of pasteurization were significant advancements for dairy producers.

In the 1950's, technological advances such as bulk handling of milk, barn cleaners, silo unloaders, and improved milking equipment spurred tremendous changes in dairying. New handling methods meant time and labor savings for farmers. Greater knowledge of animal nutrition and better ways to produce quality feeds and feed supplements increased the productivity of the dairy cow. Development of artificial insemination, progeny testing, and progress in the control and eradication of disease also contributed to increased productivity in dairying. Furthermore, improved processing plant technology meant that fewer and larger facilities provided the farm-to-retail link. Improvements in transportation and refrigeration influenced the location, structure, and efficiency of milk processing and marketing.

These technologies boosted the productivity of the entire industry. From 1955 to 1975, the milk yield per cow increased 2.9 percent annually. The rate since 1976 has been 2.3 percent. Today, the average cow yields over 13,000 pounds of milk a year, compared with 5,842 pounds in 1955 *(table 1)*. For some large, well-managed herds, annual output per cow exceeds 20,000 pounds.

These rapid gains in productivity have forced the industry to adjust, resulting in fewer but larger farms. The number of dairy farms declined from 2.8 million in 1955 to 274,000 in 1985. At the same time, the average herd size grew from 8 cows per farm to 40.

Technology Will Continue To Boost Production

Scientists have known for some time that bGH stimulates milk production. The hormone works by increasing the cow's metabolic rate, leading to higher bloodflow in the cow's mammary gland and more milk production.

In the early days of experimentation, the only hormone supply available for injection was extracted from the pituitary glands of slaughtered animals. This process was slow, expensive, and produced limited quantities. However, in recent years modern bioengineering techniques have made it possible to produce bGH in sufficient quantities to be commercially feasible.

Laboratory-produced bGH is made in a fermentation system, similar to that used to produce human insulin. The gene responsible for bGH is extracted from the pituitary glands of slaughtered cattle and is scientifically linked to harmless strains of *E. coli* bacteria. The bacteria multiply rapidly, enabling bGH to be reproduced on a large scale.

The Food and Drug Administration (FDA) has not approved bGH for general commercial use. Effects of the hormone have not been studied for more than one lactation period (305 days). Multiple lactation trials are currently in progress. Sufficient data for approval of bGH is not likely to be available before 1989 or the early 1990's.

Concerns have been raised about the possible effects of bGH on human safety, animal health, and the overall environment. Bovine growth hormone is a species-specific hormone and is not biologically active in humans. Also, published research indicates that the product has had no short-term ill effects on animal reproduction, nor does it increase the incidence of mastitis, a disease of the mammary glands, or nutritional disease in cows. From an environmental standpoint, the bacteria used to produce the hormone pose no threat because they are able to survive only in a controlled environment.

Questions about the long-term impacts of bGH on animal health and productivity re-

Table 1. Today It's Fewer But Larger Dairy Farms

Item	1955	1975	1985	Percent change per year[1] 1955-75	1975-85
Number of cows (thousands)	21,044	11,139	11,025	-3.1	-0.1
Farms with cows (thousands)	2,763	444	274	-8.7	-4.7
Average number of cows per farm	8	25	40	5.9	4.8
Milk per cow, annual (lbs.)	5,842	10,360	13,031	2.9	2.3
Total milk produced (mil. lbs.)	122,945	115,398	143,667	-0.3	2.2

[1]Compound annual rate.

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main, however. Of particular concern are the effects of animal stress on feed consumption, animal health, and milk production in high-temperature, high-humidity regions.

Commercial Use Hinges on Several Factors

Following FDA approval, the commercial adoption of bGH will depend on the expected gains in production, cost of using the technology, the initial milk price, and the impact of greater supplies on milk prices, which are regulated by Federal policies.

Research conducted in controlled experiments has shown milk yields during middle and late lactation increase 10 to 40 percent within 3 days of initial injections and persist as long as daily injections are continued. Thus, 10- to 40-percent increases over the latter 225 days of lactation translate to annual gains of 6 to 25 percent. Somewhat lower yield increases may be expected under actual farm use. In addition, while most controlled experiments have been conducted with injections during middle and late lactation, when milk yields tend to decline, the optimal time for administering bGH is still being researched.

The actual effects of bGH will vary among farms, depending on such factors as management skills, resources, and weather. The heat and humidity in some areas of the South, for example, lower the amount cows eat and the rate at which they convert feed into milk. As a result, Southern farmers may not see output gains as large as their counterparts in more moderate climates.

Greater feed use is one apparent cost of using bGH. Cows treated with the hormone require more nutrients to adjust for the increased milk production. However, because fewer cows are needed to produce the same amount of milk, total feed consumption of a herd could decrease 5 to 10 percent. Greater efficiency would result as a smaller portion of feed goes toward maintenance of the herd and a larger share to producing milk.

Today, the average cow yields over 13,000 pounds of milk a year, compared with 5,842 pounds in 1955.

Under current technology, the hormone must be injected daily. Estimates by USDA's analysts indicate the daily cost of the injections will run from 15 to 50 cents per cow. The actual price will depend on the cost of producing bGH, the number of manufacturers competing in the market, and whether sufficient supplies of bGH are available to meet demand. As with many new technologies, the cost per dosage

should go down as bGH is more widely produced and adopted.

Because bGH is likely to be relatively inexpensive, it will be accessible to most dairy producers. This could mean that even farmers with small to midsize herds will benefit from adoption of the growth hormone. It has even been suggested that because bGH is administered through daily injections, the technology might favor smaller producers who manage their herds more closely. Research is underway, however, to develop labor-saving, time-release implant doses of bGH or a system requiring less frequent injections.

In deciding whether to adopt bGH, the individual producer will weigh the additional revenue from increased milk production against the costs of the treatment and associated changes in feed costs and other variable expenses. Over the longer term changes such as the rate of animal replacement will also be a factor. Consider the following simplified example of a hypothetical dairy farmer with 50 cows that produce an average of 13,600 pounds each *(table 2)*. Based on a farm price of $12.40 per hundredweight, the base revenue for this hypothetical dairy farm is $84,320 annually.

Adopting bGH means higher costs for the farmer. The growth hormone is assumed to cost 25 cents per cow per day for injections over 225 days of the 305-day lactation period. Increased feed and other expenses are estimated to total $3.75 for every additional hundredweight of milk produced.

If bGH boosts output by 5 percent, the per-cow gain would be 680 pounds of milk. At $12.40 per cwt, the producer would earn an additional $84 per cow from bGH. Costs per cow, however, would rise slightly less than $82 annually. The net revenue to the producer would be $2.57 per cow, or about $128 for a farmer with a 50-cow herd.

If output increases 10 percent with bGH, each cow would produce 1,360 more pounds of milk a year. The change in net revenue would be about $61 per cow, for a total gain of about $3,050 for this farm. If bGH produces 15 percent more milk per cow, the extra net revenue would rise to over $6,000.

The benefits of bGH to the dairy producer depend on the price of milk (largely determined by the Federal price support program). At a 5-percent increase in productivity, the 10 million cows now on dairy farms would produce 7 billion pounds more milk, 14 billion pounds more with a 10-percent increase in output, and 21 billion

Table 2. Hypothetical Farm Shows Possible Gains from bGH

Item	Units	Base	Increase in per-cow output		
			5 percent	10 percent	15 percent
Current prices and policies:					
Milk output per cow	Lb.	13,600.00	680.00	1,360.00	2,040.00
Value at $12.40 per cwt	Dol.	1,686.40	84.32	168.64	252.96
Changes in costs per cow:					
bGH ($0.25 a day with injections for 225 days)	Dol.	NA	56.25	56.25	56.25
Added feed and misc. expenses ($3.75 per cwt milk)	Dol.	NA	25.50	51.00	76.50
Total change in costs	Dol.	NA	81.75	107.25	132.75
Change in net revenue per cow:					
Value to a 50-cow farm	Dol.	84,320.00	2.57	61.39	120.21
			128.50	3,069.50	6,010.50
Change in U.S. milk:[1]					
Production	Bil. lb.	NA	7.02	14.04	21.06
Removals	Bil. lb.	NA	7.02	14.04	21.06
Change in dairy program costs	Bil. dol.	NA	.90	1.80	2.71

NA = Not applicable. [1]Assumes 100-percent adoption.

pounds more with a 15-percent gain. Such increases in the total milk supply in the face of relatively constant demand would mean lower prices or substantial increases in Government costs.

Returning to the hypothetical farm, bGH is profitable to use even if it increases milk production by only 5 percent. But what if the support price of milk was reduced by a comparable 5 percent in an effort to cope with increased supplies? The additional revenue earned would drop to $80, but costs would remain at $82, yielding a deficit of $2 per cow.

As the price of milk declines, bGH must increase milk output by a larger percentage for the technology to be profitable. For the hypothetical farm, a 6.6-percent increase in output would be necessary if the price of milk falls to $10.00 per cwt *(table 3)*. A decline to $6.00 per cwt would boost the needed output gain to 15 percent.

The actual effect of increased supplies on prices is uncertain and will depend on how quickly producers adopt bGH, the resulting increase in output, and the number of producers who adopt the new technology. However, declining prices in the short run may prompt supply adjustments—either fewer milk cows will be needed or some dairy producers may decide to leave dairying. Because the Federal dairy program relies on rigid price supports, the price of milk will fall until it reaches the support price. At that point, the extra milk will be purchased by the Government.

Table 3. Breakeven Increase in Output Needed at Various Milk Prices

If milk price is:	bGH must increase milk output by:
Dollars	*Percent*
12.00	5.0
11.00	5.7
10.00	6.6
9.00	7.9
8.00	9.7
7.00	12.7
6.00	15.0

In the long run, market demand, Government programs, and price will determine how much milk is produced. If fewer farmers are needed to produce all the milk the market and the Government are willing to absorb, prices will drop and there will be further adjustments toward a smaller national dairy herd and fewer but larger dairy farms.

Implications of bGH for Dairy Policy

With the clear abundance of milk in the United States, many believe it is undesirable to pursue technology that will enhance production and possibly force a large number of dairy farmers out of business.

Technological advances like bGH, thus, can be a double-edged sword. Technology has increased yields and cut unit production costs to the point that Americans spend a smaller share of their income on food than people in any other nation. This same technological change has imposed significant structural and financial adjustments on farmers. Large investments in technology have eroded the margin between farm costs and prices, yet farmers are forced to either keep pace or leave the sector. This "technological treadmill" has been a major contributor to the continuing drop in the number of U.S. farms and growth in farm size.

An implication of bGH, like the technologies that came before, is the prospect of lower prices and perhaps fewer farmers. However, the potential benefits of bGH are greater efficiency, lower costs of production, the essential ability to compete in the world dairy market and with substitute dairy products, and increased consumption at lower consumer prices. □

Membership Wholesale Clubs: A Low-Price Alternative

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Offered the choice of paying $3.29 or $2.79 for a 12-pack case of 12-ounce Pepsi's, obviously most buyers would choose the lower price. This price appeal goes a long way toward explaining the meteoric rise of wholesale clubs—fully computerized "no-frills" operations offering a limited selection of first quality, name-brand merchandise to small businesses and selected groups of consumers.

Today's clubs trace their lineage to the cash-and-carry operations started more than 50 years ago by wholesale food distributors to serve their small business customers who couldn't buy in large quantities. As the name implies, customers pay cash at these outlets and assume responsibility for receipt and delivery of their order, thus avoiding distributor service charges.

The wholesale club was born in 1976, when the San Diego-based Price Company added a new twist to the cash-and-carry industry by opening a member-only warehouse where businesses and individuals were allowed to shop. Since then, 17 other companies have started operations patterned after the Price Company outlets, creating a booming mini-industry.

In 1985, membership wholesale clubs did an estimated $4.4 billion worth of business, roughly double that of 1984. In 1986, sales will likely exceed $8 billion. By December 1986 *(table 1)*, there will be close to 230 wholesale clubs, compared with 80 at the end of 1984. The industry has attracted such heavyweights as Zayre, Wal-Mart, Kroger, and Pay "n Save, who have their own versions. Clubs can now be found in most of the 100 largest U.S. metropolitan markets.

A New Type of Store

Clearly different from the conventional supermarket or discount store, the wholesale club is more accurately described as a retail/wholesale hybrid. These membership-only distributors straddle the line between wholesaling and retailing by offering discounted prices previously available only to larger businesses that ordered merchandise in bulk.

With no frills and limited variety, low prices largely explain the meteoric rise of wholesale clubs.

The clubs have two classes of members: wholesale and group. Wholesale members include retail grocers; restaurants; professional service providers, such as accountants and lawyers; and other business establishments. Normally, these firms use the purchases in their businesses and view clubs essentially as their wholesale suppliers. Members pay an annual fee to buy products at posted wholesale prices. In 1985, the fee averaged $25.00.

Group members are individuals whose employment by banks, credit unions, public utilities, government agencies, or any other organization designated by the club qualifies them for membership. These customers usually buy food and other products for home use. The inclusion of these group members, in particular, has enlarged the customer base of wholesale clubs over that of traditional food distributor cash and carries. Some clubs charge group members an annual fee. Those that don't usually require that members pay a stated percentage above posted wholesale prices, about 5 percent in 1985.

Most wholesale clubs stock 4,000 to 6,000 items. This compares with up to 25,000 items offered by conventional supermarkets and 30,000 to 50,000 items stocked by traditional discount stores. However, a club's range of items is broad—from microwave ovens to plastic trash bags. Within any product category, clubs stock only a couple of fast-moving, well-known brands. Grocery items account for 40 to 60 percent of clubs' sales, with general merchandise making up the remainder.

Included in their food lines are canned peas, trout fillets, and frozen french fries. In short, there is the range of products, though not the variety of brands and sizes found in supermarkets. Also offered are brooms, soap, paper towels, light bulbs, and similar products typically found in grocery stores.

Clubs' food lines are geared primarily to supply restaurants and other foodservice operations. Therefore, their lines include institutional sizes and packs, such as No. 10 cans of string beans (108 ounces) and prepared trays for quick heating and service.

Clubs' general merchandise lines include hardware, appliances, auto supplies, consumer electronics, clothing, and furniture.

Warehouse Clubs in Profile

Whether a business or consumer, members of wholesale clubs will usually find everyday prices below those charged by any other type of retailer and, oftentimes, by many wholesalers and distributors. The products are almost always purchased directly from the manufacturer, often at discounted prices, and sold to the membership from the warehouse floor. Clubs do not guarantee daily availability of any item.

Many of the "frills" that would otherwise raise overhead costs are absent in wholesale clubs. Gone are the use of advertising; catalogs; fancy showrooms or fixtures; credit cards sales; sales help; bagging groceries; delivery service for large appliances, such as refrigerators and washing machines; and after-sale service.

Although clubs lack many amenities, one central feature of all clubs is the widespread use of computers in all phases of their oper-

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ations, from preparing data bases of membership sales and demographics to tracking inventory and checkout scanning.

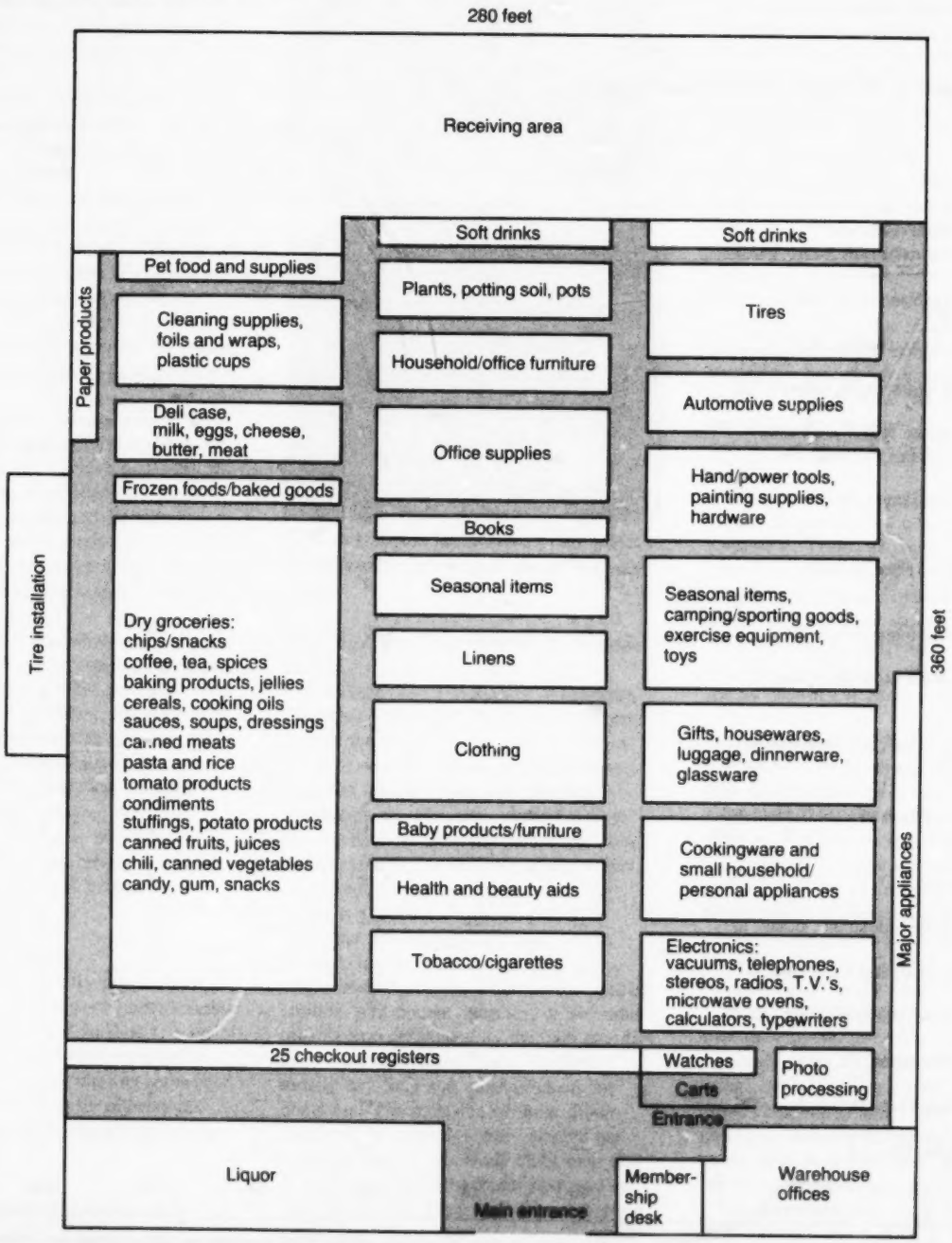
Sophisticated computer technology, the "bare-bones" format, and large sales volume form the core of clubs' operating efficiency. Price Company, the industry leader, generates annual sales of around $1,000 per square foot, but the typical club

Table 1. Membership Wholesale Clubs Growing

Company	Operating as of July 1986 By region[1]					Expected by	
	NE	S	NC	W	Total	Dec. 1986[2]	Dec. 1987
Sam's Wholesale Club (Wal-mart Stores, Inc.), Bentonville, AR	—	31	4	2	37	45	[3]
The Price Company, San Diego, CA	—	3	—	22	25	30	40
Costco Wholesale Club, Seattle, WA	—	5	2	14	21[4]	35	50
PACE Membership Warehouse, Denver, CO	1	13	2	4	20	25	35-39
Super Saver Wholesale Warehouse Club, (A. Howard Wholesale), Monroe, LA	—	13	1	—	14	21	36
BJ's Wholesale Club (Zayre Corp.), Natick, MA	8	1	3	—	12	15	25-27
The Warehouse Club (Pay 'N Save Corp.), Skokie, IL	—	—	9	—	9	14	19-21
The Wholesale Club, Indianapolis, IN	—	—	6	—	6	11	18-20
Value Club (Southwest Merchandising), San Antonio, TX	—	6	—	—	6	6	6
Price Saver's Wholesale Club (The Kroger (Co.), Salt Lake City, UT	—	—	—	5	5	9	[3]
Makro Self-Service Wholesale (SHV Holding), Cincinnati, OH	1	2	1	—	4	4	
Buyer's Club, Aurora, CO	—	—	—	2	2	3	12
Club Wholesale (Elixir Industries), Boise, ID	—	—	—	2	2	2	5
D-Mart Wholesale Club, Salt Lake City, UT	—	—	—	2	2	2	
Member$ Warehouse, Winston-Salem, NC	—	2	—	—	2	3	7
Wholesale Plus, Plantation, FL	—	1	—	—	1	1	1
American Wholesale Club, Richardson, TX	—	1	—	—	1	1	
Save Club, Concord, CA	—	—	—	1	1	1	
Total	10	78	28	54	170	228	[3]

[1]NE = Northeast; S = South; NC = North Central; W = West. [2]Company estimate as of July 1986. [3]No estimate available. [4]Costco operates two clubs in Canada, one in Alberta and one in British Columbia.

Figure 1. Typical Membership Warehouse Layout



averages between $400 and $600.

Clubs' labor costs average 5 percent of sales, compared with around 10 percent in conventional supermarkets. However, some clubs achieve a labor cost average of only 2.5 to 3 percent.

Labor-saving steps permeate every phase of operations. For example, clubs specify shipments on wooden pallets where possible, so that goods may be placed directly on the sales floor with minimum handling. Bulky items are displayed close to receiving docks. Restocking, a primary task of store labor, is accomplished using forklifts that pass up and down wide aisles.

Operating efficiencies are reflected in a minimal gross margin, resulting in prices that are hard to beat. The gross margin, or markup, is the difference between what the retailer pays for a product and its retail price. For a typical discount store, the markup is equal to about 30 percent of what the manufacturer charges for the product. Markups for conventional supermarkets are close to 20 percent, while those for department stores are 40. For wholesale clubs, on the other hand, the overall gross margins range from 8 and 11 percent, depending on the club's efficiency of operation and volume of sales. Margins on groceries range from 6 to 9 percent.

Customer Appeal—Low Prices

Wholesale clubs operating profitably on low margins have created a niche that appeals to a legion of small businesses who use the clubs to stock their own outlets and who typically view the club as a wholesale supplier. For example, a small restaurant operator can buy one case of ketchup or even one bottle at a wholesale club. A full-service, general-line wholesale distributor, in contrast, requires larger minimum orders because of the high cost of servicing small accounts. However, there are some higher costs for the small business buyer—for example, the expense of picking up the goods from the club. Usually the large wholesale distributors deliver.

Clubs are also economical suppliers of stationery, filing cabinets, and other office supplies needed in professional offices. Considering the economy and accessibility of wholesale clubs, it is not surprising that small retailers, restaurateurs, and other businesses are the main customers, accounting for over 50 percent of all clubs' sales.

For some consumers, the discount prices offset the limited variety, drab decor, and out-of-the way locations. Clubs generally offer 20 to 40 percent lower prices than traditional establishments. For example, in the Washington, D.C., area in mid-1986, an 8.5-ounce package of Stouffer's Lean Cuisine glazed chicken with vegetables cost $3.29 at a large supermarket chain, but $2.39 at Pace Warehouse Club. Of course, customers' savings depend on the products they buy.

The Industry Now...

Still in its infancy, the wholesale club industry is highly concentrated, with just four firms accounting for 75 percent of all sales. Price Company captured 41 percent of all club sales in 1985, Sam's accounted for 16 percent, Costco 11 percent, and Pace 7 percent.

Although sales concentration is high, the industry continues to be very competitive. Fueling the competition is rapid expansion by existing firms and entry by new firms. For example, all of the leaders scheduled new openings for the latter half of 1986, ranging from five locations for the Pace Membership Warehouse firm to 14 for the Costco Wholesale Club.

The geographical dispersion of the clubs also may figure prominently in shaping competition. Early in their development, clubs were concentrated on the West Coast. In 1983, that distribution changed substantially. The South now has 80 clubs, nearly half of the units operating in mid-1986. One result of this geographic expansion is direct competition among clubs. For example, the Makro Company was the sole firm operating in the Washington, D.C., area until Pace's entry in 1985.

Equally important in determining the state of competition in the industry is the entry of new firms. In the first half of 1986 alone, four new firms opened six clubs. Continuation of this trend will mean lower concentration in the future.

...And in the Decade Ahead

The success of wholesale clubs lies with their targeting a market that is not served or only partly served by existing businesses. Some industry observers estimate wholesale club sales at $24 to $29 billion by 1991, at least three times the 1986 level.

However, certain limitations could slow growth. Market saturation is one potential drag on wholesale club expansion. The population needed to support a club is estimated at 400,000. Thus, even areas with high population concentrations can support only a limited number of clubs.

Yet another possible brake on wholesale clubs' expansion is the competition from traditional wholesale establishments, supermarket chains, specialty stores, and other retail outlets that handle the same kinds of products. These firms can be expected to offer competitive prices where wholesale clubs encroach on their markets. Thus, these other outlets' lower prices, coupled with attractive decor, delivery, bagging, and other services, may limit the growth of wholesale clubs.

Profitability in a low-margin operation greatly depends on economies achieved through rapid inventory turnover and huge sales volumes. Faced with increased competition, both among themselves and from their more traditional counterparts, wholesale clubs may be tempted to loosen membership requirements, expand variety, upgrade decor, and add services to increase unit volume. The risk is that such deviations from the wholesale club format could increase the cost of operations, thereby negating their greatest strength—low prices.

For all of their similarities, clubs strive to differentiate themselves from each other. For example, Makro offers greater variety within product lines than its competitors. Sam's mails seasonal flyers to its members and is opening stores in smaller cities. Differentiation will assume greater importance as firms expand and find themselves in direct competition with each other and with traditional retailers. □

Supermarket Characteristics: A Continual Evolution

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One-stop shopping may be as close as your local grocery store. Some new stores make it possible for you to buy groceries, have prescriptions filled, and even do your banking—all at one location and at almost any hour.

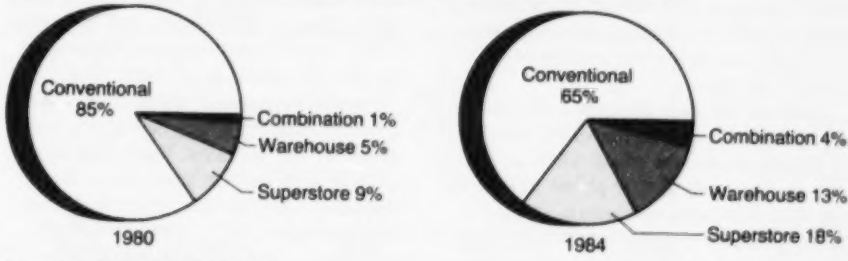
The trend to "more-than-food" stores signals significant changes in the supermarket industry, brought about by changing demographics, lifestyles, and purchasing patterns. More working women, for example, means less time to go to several different stores for food and other items. The convenience of one-stop shopping has also prompted rapid growth in the number of supermarkets in shopping centers and malls. Furthermore, the multiple-career household means it may be more difficult for families to shop during traditional store hours. Thus, many retailers have adopted 24-hour schedules and Sunday hours.

The approximately 30,831 supermarkets in operation in 1977 accounted for 17.2 percent of all grocery stores, including convenience food stores and small supermarkets and grocery stores. By 1984, the number of supermarkets had declined to 26,947, 16.4 percent of the total. Though this was the case, supermarkets still accounted for 75 percent of sales by all grocery stores.

Major changes occurred in the supermarket industry during the late 1970's and early 1980's. Not only were larger stores built, but they offered a greater variety of products, services, and departments. Today's store formats may include a complete bookstore, video cassette library, wine and cheese shop, leisure wear boutique, and health food center. Popular formats in use today are: conventional, combination food and drug stores, superstores, and warehouse and limited assortment stores *(see sidebar box)*. The majority of supermarkets (65 percent) still fit the conventional format *(figure 1)*. However, the use of other formats is increasing.

The authors are agricultural economists with the Food Marketing and Consumption Economics Branch of the National Economics Division.

Figure 1. New Formats Account for Growing Share of Supermarkets



Source: Economic Research Service, USDA.

A nationwide survey by the Economic Research Service (ERS) in 1982 provided a closer look at the new and conventional supermarket formats. Of course, changes have occurred in the few years since the survey, but what was revealed then still holds true today. The survey examined the types of services offered, as well as other characteristics, such as chains versus independents, formats, and size of a representative sample of 747 stores. Of these stores, 491 were chain stores and the remainder were independents (retailers with fewer than 11 outlets). Conventional supermarkets accounted for 81 percent of the ERS sample, while combination food and drug, and superstores made up 15 percent. Warehouse and limited assortment stores made 4 percent of the sample.

The survey also evaluated formats according to size and found that the new store types were larger than the conventional ones. Most conventional supermarkets were about medium-sized, with 10,000 to 19,999 square feet of selling area (the total store area minus backroom and storage). Combination food and drug and superstores, however, were typically much larger, ranging between 20,000 and 39,999 square feet. Warehouse and limited assortment stores had the smallest selling areas—below 10,000 square feet.

Conventional stores were just as likely to be located in suburban as central city areas. In contrast, the new store formats, because they generally require more space, were often found in suburban areas. All of the new format stores were most often located in shopping complexes, though a slightly higher percentage of warehouse and limited assortment stores were stand-alone units.

According to the survey, the majority of stores were open 15 hours or less a day. Most of these were conventional stores and stores with 10,000 to 19,999 square feet of selling area. Conventional stores also figure prominently among stores open more than 15 hours. These stores, along with combination and superstores, accounted for the largest shares of stores with extended hours. Twenty-nine percent of the total sample were open more than 15 hours a day, and 42 percent of these (12 percent of the sample) were open 24 hours. The primary location for stores open longer than 15 hours a day was in shopping complexes.

Store Services Provide New Competitive Tool

The services provided in the supermarket system of the 1980's not only offer customers flexibility and convenience, but serve to attract more people and increase store sales.

Supermarkets offer a diversity of services—from bagging groceries to handling utility bill payments. Of the 20 services included in the ERS survey, 11 were offered by a majority of the stores *(figure 2)*. Coupon redemption, the most common service, was offered by over 97 percent of the stores. Bagging was second in frequen-

cy, followed by check cashing, product price marking, in-store music, employee uniforms, express checkout, bottle deposits, unit pricing, and carryout (loading customers' packages in their vehicles). Utility bill payments was the service offered the least.

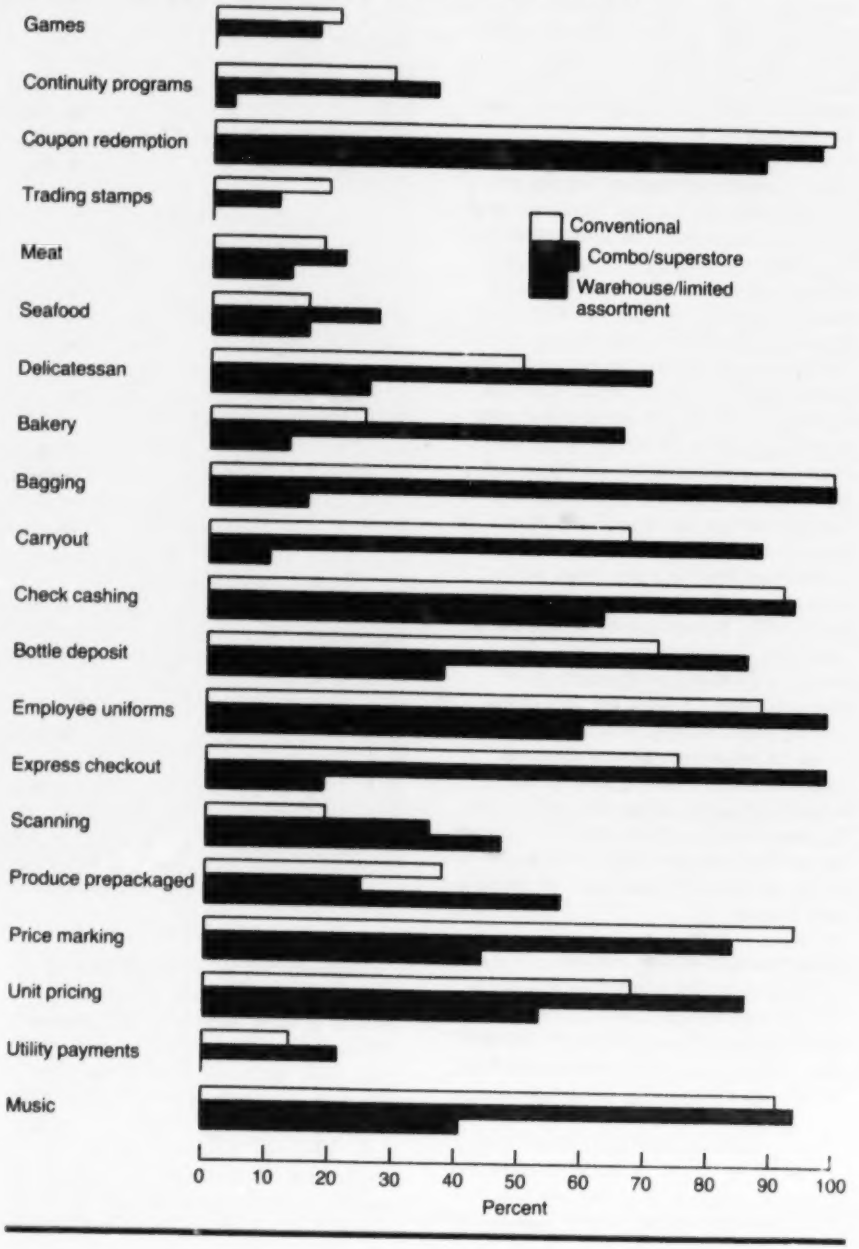
Chain stores offered more contests and games than did independent stores. Continuity programs—where each week consumers can buy a different item in a set, for example, dishes, flatware, or encyclopedias—were also more common in chain stores. Chains were more likely to offer full-service delicatessens and bakery departments. However, more independent stores offered full-service meat departments than did chain stores. Independent stores were less likely to offer employee uniforms, express checkouts, scanning, unit pricing, utility bill payments, and in-store music.

The services offered also varied among stores with different formats. Combination and superstores, for instance, were more likely to offer full-service seafood, delicatessens, and bakery sections than conventional stores. Carryout service, bottle deposits, employee uniforms, express checkout, and unit pricing were also more common for these two new formats.

When stores install scanner systems, prices no longer need to be marked on individual items. The scanning systems read prices at the cash register from the Universal Product Code (UPC) printed on the package. Survey results showed that while small stores more often marked prices, larger stores (which are more likely to use scanners) had only shelf tags listing the price per item and per unit of measure (ounce, pound, count, etc). More warehouse stores offered scanning systems than did any other type of store.

Promotional services are generally used to attract more customers into the store and may include contests and games, coupon redemption, continuity programs, and trading stamps. Survey results showed that stores offering games had no significant

Figure 2. Services Offered by Supermarkets Vary With Format



differences by store size. Coupon redemption also seemed to be a popular service regardless of store size. Continuity programs, however, were primarily offered by stores with more than 10,000 square feet. Medium-size stores of 10,000 to 19,999 square feet were more likely to carry trading stamps.

Stores offering full-service departments (meat, seafood, delicatessen, and bakery) varied significantly by size. Small and large stores were more likely to have full-service meat, fish, and seafood sections than the medium-size stores. The larger the store, the more likely it was to offer full-service delicatessen and bakery departments.

Bagging generally was offered in all size stores, except warehouse stores. Carryout was more common in stores above 20,000 square feet. About 86 percent of the stores in all size groups accepted payroll or personal checks for grocery purchases. Express checkout service was more likely offered by large stores than by small ones.

Operating hours in many stores allow consumers to shop before and after peak traffic hours. Survey results showed that a significant share of stores offering full-service seafood and meat sections were open more than 15 hours per day. Stores offering check cashing, bottle deposits, uniforms for employees, express checkout, scanning, and unit pricing usually had longer hours of operation than stores offering other services. Stores open 15 hours per day or less were more likely to offer full-service delicatessens, bakeries, and prepackaged produce.

Coming to "Terms" with Supermarket Formats

Conventional

- Self-service.
- Highest percent of food versus nonfood items.
- Size range from 3,000 to 30,000 square feet.

Combination food and drug store

- More product variety.
- Nonfood items 25 to 35 percent of sales.
- Nonprescription drugs and general merchandise.
- Prescription drugs.
- Size range from 35,000 to 45,000 square feet.

Superstore

- Some prescription drugs carried.
- Generic and specialty product areas.
- Some self-serve bulk foods.
- Average size 35,000 square feet.

Limited assortment store

- Limited number of product brands.
- Stock the most popular size products.
- Less than 10,000 square feet.

Warehouse store

- Strong price appeal.
- Size ranges from 12,000 to 35,000 square feet. Super warehouse stores range from 50,000 to 140,000 square feet.
- Primarily food, some health and beauty aids, but low general merchandise emphasis.

Supermarkets of the Future

The trend toward larger supermarkets is likely to continue, with superstores becoming the major vehicles for growth. Suburban areas will likely be the primary location for these larger stores.

Computers will be more important in tomorrow's supermarkets. Computer-assisted services, such as coupon dispensing, electronic store directories, and automatic teller machines (ATM's) that allow customers to transfer funds from their bank accounts, will soon be offered on a broad scale. Electronic directories that tell customers where to find individual products are now being tested in area markets across the country, and the ATM's are already in use in some supermarkets.

With specialty services such as delicatessens, bakeries, and seafood sections already commonplace, there will likely be a growing trend toward more prepared food and snack bars in supermarkets. This will enable supermarkets to compete with the eating-away-from-home sector, which is claiming a larger share of the food dollar—43 percent in 1985, versus 28 percent in 1962. □

Where the Food Dollar Goes

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Except for housing, Americans spend spend more on food than any other item. With so much being spent, the question arises: What part of the dollar pays for the food and what part for the services that bring it to the plate? The answer lies with the marketing bill, which reflects the costs of processing agricultural commodities into food and bringing them from the farm to consumers.

Consumer expenditures for foods originating on U.S. farms totaled $343 6 billion in 1985 *(table 1)*. This amount was less than the total consumers spent for all food because it excluded expenditures for imported foods and fishery products.

The farm value represented about a fourth of the almost $344 billion, with the marketing bill accounting for the rest. The farm value portion of total expenditures has dropped from about a third in 1975. The smaller share is due both to weak farm prices and rising marketing costs.

The farm value share varies greatly among foods, depending on the degree of processing and the amount of services required to move a given commodity through the marketing system. In general, animal products have the highest ratios of farm value to retail price, and the more highly processed crop products have the lowest.. For example, the 1985 farm value of eggs, a commodity requiring little processing, represented 61 percent of retail prices. On the other hand, the farm value of cereal and bakery products, which require much processing and marketing, accounted for only 10 percent of retail prices.

The marketing bill encompasses four food industry functions—processing, wholesaling, transporting, and retailing. Generally, the bill accounts for a higher portion of total expenditures in the away-from-home market. The farm value share is smaller in the away-from-home market because the cost of the increased labor needed to prepare food for this sector diminishes the relative value of the farmer's contribution to the final product *(figure 1)*. For the same reason, foodservice costs are much greater than the retailing counterpart in the at-home market—62 cents of the food dollar versus 22 cents. Processing is a larger share of at-home than away-from-home food expenditures. However, when allowance is made for the large cost of foodservice relative to food retailing, the processing cost is about the same. This suggests that retail stores and away-from-home outlets purchase about the same proportions of raw and processed foods.

Increased eating away from home is reflected in the marketing bill. In 1975, food away from home represented only 35 percent of the marketing bill. By 1985, this figure had increased to nearly 42 percent.

Table 1. Consumer Expenditures, Marketing Bill, and Farm Value: At-Home and Away-From-Home Markets

	Total expenditures	Food at home[1]	Food away from home[2]
Food expenditures		*Billion dollars*	
1975	167.0	116.2	50.8
1980	264.4	180.1	84.3
1981	287.7	194.0	93.7
1982	298.9	196.7	102.2
1983	315.0	204.6	110.4
1984	332.0	213.1	118.9
1985[3]	343.6	219.4	124.2
Marketing bill			
1975	111.4	72.2	39.2
1980	182.7	113.9	68.8
1981	204.5	127.0	77.5
1982	215.2	129.9	85.3
1983	229.3	136.5	92.8
1984	240.6	140.0	100.6
1985[3]	257.2	150.4	106.8
Farm value			
1975	55.6	44.0	11.6
1980	81.7	66.2	15.5
1981	83.2	67.0	16.2
1982	83.7	66.8	16.9
1983	85.7	68.1	17.6
1984	91.4	73.1	18.3
1985[3]	86.4	69.0	17.4

[1]Primarily purchased at retail food stores for use at home. [2]Includes food purchased in restaurants, snackbars, hospitals, schools, etc. [3]Preliminary.

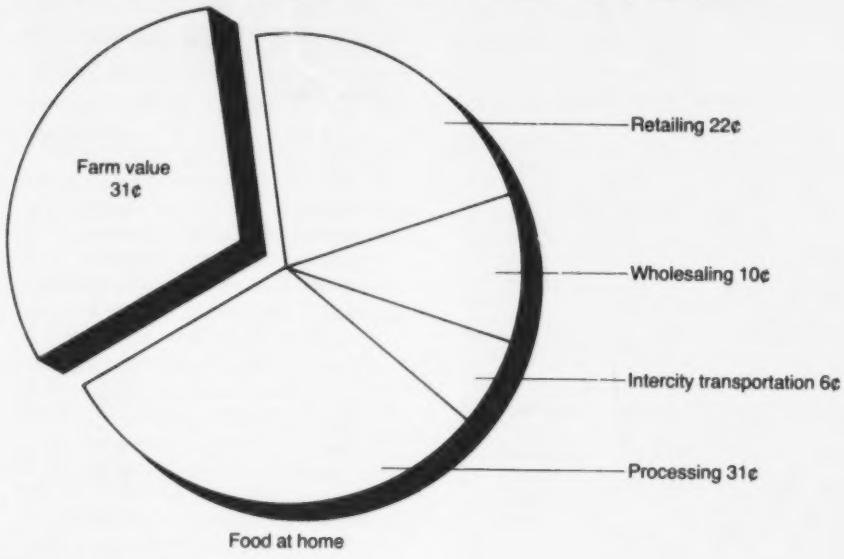
Totals may not add due to rounding.

Labor Makes Up Almost Half of Marketing Bill

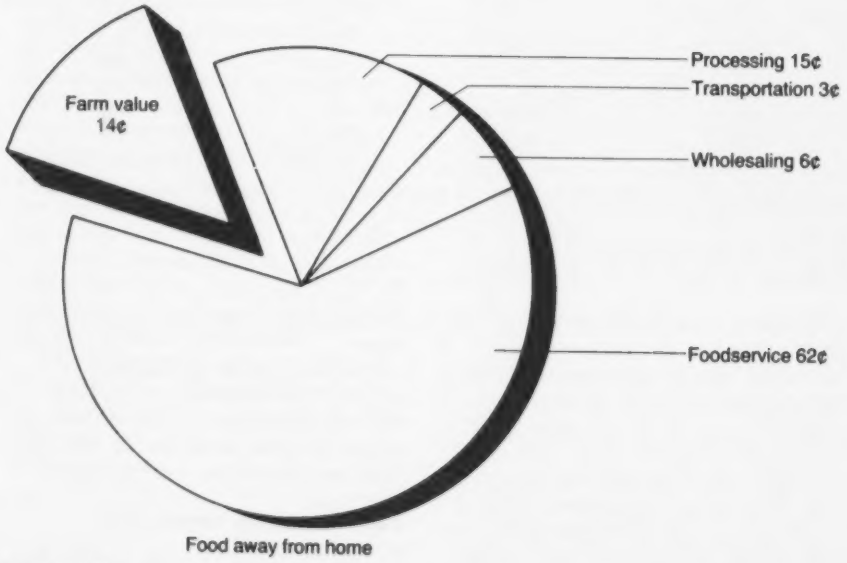
Consumers paid $257.2 billion to cover the costs of processing and marketing

The author is an agricultural economist with the Food Marketing and Consumption Economics Branch of the National Economics Division.

Figure 1. Farm Value Takes Larger Share of Dollar Spent for Food At Home



Based on 1985 data.



Based on 1985 data.

domestic farm food in 1985. Labor, packaging, and transportation costs represented almost 47 percent of the total food dollar *(table 2)*.

Labor costs accounted for 34 percent of total consumer expenditures and 45.4 percent of the marketing bill in 1985, a 7.1-percent gain from 1984 to 1985. Higher management compensation and increased employment were primarily responsible for the hike. Also, employee benefits rose because of higher costs of pensions and insurance plans, as well as legally mandated increases for Social Security and unemployment compensation.

Total food industry employment increased 4.6 percent, from 10.4 million workers to 10.9 million. Eating and drinking places constituted the largest employer, accounting for over half of the total food marketing work force. Increased sales due to the 1984 economic recovery accounted for a 4.8-percent rise in employment in this sector in 1985. Although food-away-from-home establishments were the largest employer, the greatest increase in employment occurred in the retail sector, which gained 6.3 percent. Much of this increase was due to rising employment in specialty departments, such as in-store bakeries and delicatessens.

Employment in food manufacturing showed the smallest increase, only 1.4 percent. The slight gain reflects continued mechanization and increased employee skills that raise productivity. Furthermore, food manufacturers generally reinvest profits in capital, such as plants and equipment, rather than in unrelated industries, thereby producing more capital-intensive operations.

Wholesale employment rose slightly, reflecting increased demand for wholesaling services from marketing functions at the consumer level. Interestingly, the two segments dealing directly with consumers—retailing and foodservice—had 5-percent increases in employment, double the increase for manufacturing and wholesaling combined. Despite the increase, the manufactur-

Table 2. Labor Accounts for the Largest Share of the Food Marketing Bill

	1975	1980	1981	1982	1983	1984	1985[4]
	Billion dollars						
Total marketing bill	111.4	182.7	204.5	215.2	229.3	240.6	257.9
Labor[1]	48.3	81.5	91.0	96.6	102.4	109.1	116.8
Packaging	13.3	21.0	22.8	23.2	24.3	26.3	27.1
Transportation[2] (rail and truck)	8.4	13.0	14.3	14.7	15.4	15.9	16.3
Fuel and power	4.6	9.4	10.3	11.3	12.0	12.7	13.3
Corporate profits (before taxes)	7.1	10.9	12.0	13.0	14.7	15.9	17.0
Other[3]	29.7	46.9	54.1	56.4	60.5	60.7	66.7

[1]Includes supplements to wages and salaries, such as pensions and health insurance premiums. Also includes imputed earnings of proprietors, partners, and family workers not receiving stated renumeration. [2]Excludes local hauling charges. [3]Includes business taxes, depreciation, rent, advertising, interest, and other costs. [4]Preliminary.

ing and wholesaling industries employed only 22 percent of all food industry workers.

While the number of workers in retailing has grown, so has productivity. Several innovations in food retailing have enhanced output per store. First, smaller grocery stores are being replaced by "superstores" that offer a number of specialty departments. These departments allow operators to take advantage of economies of size by offering a greater diversity of merchandise per square foot of store space. Second, more items can be offered in a given amount of space by presenting products in a warehouse-type format, as opposed to traditional displays. Third, electronic scanning equipment eliminates manual price marking, thereby offering large labor savings. The number of grocery stores using this technology has more than tripled since 1980. Furthermore, the share of total grocery sales accounted for by scanner-equipped stores increased from 15 to 50 percent between 1980 and 1985.

Despite the productivity achieved by these innovations, some stores' gains have been offset by added services that require more labor, such as salad bars. As a result, the total change in labor productivity may be relatively small.

The Marketing Bill

The marketing bill discussed in this article is an estimate of the total charge for marketing all U.S. farm foods, including those consumed in restaurants and other eating places and those bought in retail food stores. It is the difference between total civilian expenditures for these foods, or the total food dollar, and total farm value. Marketing bill statistics are affected by changes in prices, volume, type of products marketed, and the quantity of marketing services per unit of product. Marketing bill statistics show the distribution of the food dollar between the many participants and cost components involved in marketing food.

Packaging Costs Show A Small Increase

Packaging materials were the second largest marketing cost in 1985, accounting for 7.9 percent of the total food dollar. Packaging materials' share of the marketing bill has been relatively constant over the last decade and totaled 10.5 percent in 1985. Costs rose only 3 percent in 1985, as larger oil supplies led to lower petroleum prices, decreasing the cost of producing plastics and metal. Furthermore, overall prices of packaging materials rose only 0.2 percent. Thus, most of the 3-percent cost increase was due to more food moving through the marketing system and changes in the types of packaging, including more microwave-ready containers.

Major packaging materials, in order of importance, include fiber boxes; sanitary food containers for products such as fluid milk, ice cream, and frozen foods; folding boxes; metal containers; plastic; and glass. Most of the increase in packaging costs was due to greater use of paper and paperboard products, reflecting larger quantities of food in the marketing system. These materials accounted for 40 percent of packaging costs in 1985.

The packaging industry has benefited from a trend toward single portion meals, reflected in a larger market for fast food and convenience food. Aseptic food packaging and ovenable paperboard are two other technological developments contributing to growth in this industry. About a third of all the paper used by the food industry goes into the fiber boxes that ship nearly all processed foods.

Plastics account for approximately 15 percent of packaging costs and are used for a number of functions, including trays, bottles, and wrapping. The plastics industry is making inroads into several competing markets. Plastic bottles are being substituted for metal cans and glass for fruit drinks and are also replacing glass for such products as ketchup, mustard, and peanut butter. Finally, plastic bags are competing with paper in grocery stores. The 75-percent share of the grocery bag market currently held by the paper industry is expected to decrease in the face of stiff competition from plastics. However, this decrease may be tempered

Labor accounts for the largest share of the marketing bill. Packaging costs are the next largest.

because some consumers seem to favor paper grocery bags over plastic ones.

Energy Costs Moderated by Petroleum Surplus

Energy costs accounted for 5.2 percent of the marketing bill and 3.9 percent of total consumer expenditures in 1985. Costs increased 4.7 percent last year. Higher electric rates and greater use of fuels and energy were primarily responsible for the increase. This situation is in marked contrast to the 1970's, when energy costs increased as much as 20 percent a year because of petroleum price hikes. Last year's increase approximated the general rate of inflation. The foodservice market accounted for about a third of total energy costs. Energy costs equaled 3.8 percent of foodservice sales. Most of this was electricity for lighting, air conditioning, and refrigeration.

The retail industry is similarly dependent on electric power. Energy costs accounted for 1.5 percent of total retail sales. Retailing and processing functions each encompassed 25 percent of energy costs. The wholesaling sector took the remaining 17 percent.

Transportation and Corporate Profits Show Gains

Transportation accounted for 6.3 percent of the marketing bill and 4.7 percent of total consumer expenditures in 1985. This figure included food shipped by rail or truck, but not items shipped intracity or by water. Transportation costs increased only 2.5 percent in 1985, mainly because of low diesel fuel prices. Furthermore, trucking firms have negotiated union contracts that impose multilevel wage structures which have lowered the salaries of newly hired employees. Operating costs for trucks increased only 1 percent in 1985. The only major increase was a 1-cent-a-mile levy on trucks weighing more than 55,000 pounds. Railroad freight rates rose less than 1 percent in 1985.

Before taxes, total food industry profits rose 6.9 percent in 1985, but remained at 4.9 percent of consumer expenditures and 6.6 percent of the marketing bill. Total profits have increased as the volume of sales has grown over the years. Increased profits can be attributed to greater consumer spending, particularly in the away-from-home market. With a stronger economy, consumers purchase more processed food and eat out more frequently.

Food manufacturers' profits have also increased, reflecting lower farm value. Changes in farm prices are generally not fully reflected in prices at other marketing levels. Higher food prices are often attributed to growth in profits, but are more often caused by increased costs.

What's Ahead

Several economic and sociological trends are expected to affect the size of the marketing bill over the next 5 to 10 years. On the farm side, agricultural production adjustments will reduce surpluses that have depressed commodity prices during the 1980's. However, commodity price increases will probably not be sufficient to raise farm value relative to overall food expenditures.

Fast-paced, two-income lifestyles have reduced the amount of time available for preparing food in the home. Therefore, consumers will continue to boost demand in the foodservice sector by purchasing a higher percentage of their meals from foodservice outlets. The resulting increase in demand for restaurant personnel will mean greater marketing costs for meals away from home.

Changing lifestyles and rising per capita income have also increased the likelihood that food consumed at home will be in the form of convenience items, such as frozen dinners and entrees. Marketing services, such as deboning, portioning, cooking, seasoning, and storing, are being added to farm foods as the labor required for preparation is shifted from the consumer to the marketing system. Furthermore, supermarkets are responding to foodservice competition by expanding their operating hours and adding specialty departments, such as salad bars, in-store bakeries, and delicatessens. The increased demand for labor, resulting from both greater purchases of convenience items and augmented supermarket operations, will boost at-home costs for the consumer.

As a result of these trends, marketing costs will increase at a faster rate than the farm value. The marketing bill will continue to occupy an increasing share of total consumer food expenditures. However, the decline in the farm value share of food expenditures is expected to be at a slower rate than during the last 5 years, when farm prices were depressed. □

Consumer's View of Tomato Quality

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Most consumers aren't even aware of the grading system for fresh fruits and vegetables. Yet, grades can make a difference in what's available in the produce section. Wholesalers, food processors, and buyers for retail stores rely on grades because they purchase large quantities, often long distance. A buyer in Maine, for example, will order from a shipper in Florida. Grading allows buyers to choose product quality and helps assure that they get what they pay for.

The grades of produce wholesalers, processors, and retailers purchase depend on consumer preferences. Consumers purchase according to price and quality, and how they buy sends signals back through the marketing chain, encouraging producers to grow what's in demand. In principle, then, grades should be based on consumers' perceptions of quality. However, because quality, like beauty, is in the eye of the beholder, no standardized grading system can perfectly reflect consumer preferences.

A study by the Economic Research Service (ERS) explores consumer demand for different grades and sizes of tomatoes and assesses the implications for the current grading system. The results indicate that the standards used to grade Florida tomatoes seem to draw finer quality distinctions than consumers do. Therefore, changing tomato grades to more closely reflect consumer perceptions could increase the efficiency of tomato marketing.

Florida Supplies Most Tomatoes

Tomatoes are one of the leading fresh market vegetables. Although grown in most States, Florida supplies over 90 percent of U.S. commercial tomatoes from November to mid-June. Florida production totaled about 30 billion pounds in 1985, at a farm value of $720 million.

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Most commercially grown tomatoes are harvested as either "mature green" or "breakers." A mature green tomato has a completely green skin but has reached the stage where it will turn red on or off the vine. A breaker is a tomato in the first stage of changing color; it is primarily green with a tinge of yellow or pink, usually at the blossom end. Breakers are commonly termed "vine ripe" in the tomato industry. About 80 percent of the Florida commercial tomatoes are mature green.

Most tomatoes marketed in Florida are sold under grade and size standards specified by Federal Marketing Order 966 *(see sidebar box)*. Although consumers may think of tomato quality largely in terms of flavor, grades are based on freshness, appearance, maturity, and the percentage of defects. The four grades—U.S. No. 1, U.S. Combination, U.S. No. 2, and U.S. No. 3—are each divided into four sizes. The largest size is at least 2 24/32 inches in diameter. In the industry, these tomatoes are termed 5x6, reflecting the fact that they can be packed in a standard box six in a row, five rows per layer, three layers deep. The other tomato sizes, in descending order, are referred to as 6x6, 6x7, and 7x7. Naturally, the better grade and larger sized tomatoes command the highest prices *(table 1)*.

Price, Income, and Quality Effects

Economists typcially explain consumer demand for a product in terms of income, price, and the price of its substitutes. Income was found to have little effect on purchases of tomatoes.

In the ERS analysis, the price effects were considered in terms of three grade and size combinations: high-quality (No. 1 and combination grades), medium-quality (No. 2

What tomatos consumers buy sends signals back through the marketing chain, encouraging producers to grow what's in demand.

Table 1. Better Grades Command Higher Prices

Grade	Per capita consumption[1]	Price[2]
	lbs.	*Cents/lb.*
No. 1	.42	11
Combination	.21	11
No. 2	.13	9
No. 3	.11	7

[1]Estimated from shipment data for Florida only for November through mid-June. [2]Price is measured at 1967 dollars to account for inflation.

Source: Annual report of Florida Tomato Committee.

and No. 3, sizes 5x6 and 6x6), and small tomatoes.

Consumers bought about 1.3 percent fewer high-quality tomatoes for each 1-percent increase in price. Conversely, for every 1-percent decrease in price, consumers bought about 1.3 percent more. Demand for medium-quality, larger sized tomatoes was more responsive to price changes, falling between 1 and 3 percent with each 1-percent increase in price. Purchases of small tomatoes, in contrast, were relatively unresponsive to price changes. A 1-percent increase in the price reduced consumption of these tomatoes by less than 0.5 percent.

Economic theory suggests that, as consumers purchase more of one quality of tomato, the price of its substitute must decline to make it more attractive. In fact, this was true only for the high- and medium-quality tomatoes. For example, a 10-percent increase in purchases of combination grade tomatoes would lower the price of No. 1 tomatoes by 2.7 percent and No. 2 tomatoes by 2.2 percent. Consumers do not seem to substitute No. 3 tomatoes for higher grades. While the exact reason is not clear, the lack of substitution between low- and high-grade tomatoes means that removing low-grade ones from the market probably does not increase demand, and thus prices, of the higher grades.

Going beyond the traditional demand factors, the ERS analysis also examined how quality alone influences consumer demand for tomatoes. Looking first at the impact of size, the analysis revealed that for high- and medium-quality tomatoes, biggest was not always best in the eyes of the consumer. The second largest size tomatoes (6x6) were consumed more than any other. Even the next size, 6x7, was slightly preferred over the largest No. 1 grade tomatoes. Purchases of medium tomatoes ranged from 0.1 to 0.3 pounds per person more than large tomatoes of the same grade.

The above phenomenon did not apply to the lower quality grades. Consumers seem to regard size as a more effective quality indicator than grade for low-quality tomatoes. For example, consumers do not seem to differentiate between small No. 2 and No. 3 tomatoes. Consumers tend to regard the smallest size of both grades as being equal. On the other hand, smaller, high-grade tomatoes are preferred to larger size

Understanding Federal Marketing Orders

Federal marketing orders represent an important agricultural policy tool for growers and handlers of fruits, vegetables, and specialty crops in the United States. In general, a marketing order is a program that regulates certain aspects of the marketing of an agricultural commodity to enhance both price and quality. The orders are operated under the supervision of the U.S. Department of Agriculture.

Marketing orders permit three broad categories of activities in order to improve grower returns—quality control, quantity control, and market operation and improvement. Quality control provisions allow for the determination of minimum grades, sizes, and maturity standards to be enforced through Federal inspections. Such quality standards promote product uniformity and, so indirectly, allow for higher market prices by raising the level of product quality. Withholding poor-quality produce from the market also effectively limits the total supply of produce. Reduced supplies, in turn, may imply higher farm prices.

Quantity controls directly affect available supply and, thus, price. Supply may be controlled by limiting the short-term flow of products to market, allocating supplies between fresh (primary) and processed (secondary) markets, or restricting the quantity marketed by limiting each producer's sales.

The final category of provisions comprises a variety of activities designed to enhance commodity marketing. These include standardization of containers or packs, research and development, and a provision prohibiting unfair trade practices.

tomatoes of a lower grade. For instance, purchases of the smallest size No. 1 tomatoes were 0.06 pounds per person higher than the third size (6x7) No. 2 and No. 3 tomatoes.

Implications for the Marketing Order

Quality standards are administered by the Florida Tomato Committee, composed mainly of growers and handlers of the product. Over the years, the committee has made technical changes in the grading system to improve marketing procedures. Occasionally, the committee applies a supply management program to restrict the marketing of lower grade tomatoes in order to raise the overall quality of the product.

The standard currently employed in grading Florida tomatoes seems to delineate finer quality differences than consumers generally can perceive. Take, for instance, the undifferentiated demand between the smallest tomatoes of grades No. 2 and No. 3. This may suggest the need to eliminate the No. 3 grade.

Restricting inferior quality tomatoes has implications for tomato prices and grower returns. Limiting the supply to higher quality, higher priced tomatoes, in theory, could mean greater revenue for growers. The effect of such a restriction, however, would depend on how consumers substitute low- and high-quality tomatoes and the responsiveness of consumer purchases to a price change.

The ERS analysis reveals little substitution between the smallest No. 3 tomatoes and high-quality ones. It may be that there are different uses for these tomatoes, such as for processed products versus salads. In this case, a decrease in the supply of small No. 3 tomatoes may not mean greater consumer demand for large tomatoes and an increase in their price.

At the same time, the ERS analysis indicated that consumers do substitute small, low-quality tomatoes for small, higher-grade ones. Therefore, a reduced supply of small No. 3 tomatoes could mean higher prices for other small tomatoes. Because consumer demand for small tomatoes was relatively unresponsive to price, however, there would likely be little decline in sales. As a result of eliminating the smallest grade No. 3 tomatoes, grower revenue would increase only about $3.41 million (in 1982 dollars). □

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International Guidelines for Consumer Protection

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Guidelines to protect consumers in developing countries from unsafe food and drugs have been adopted by the United Nations (UN). This is the first time consumer issues have moved into the international arena.

The UN first proposed international guidelines to protect consumers in 1981, following disputes between countries over safety and quality standards for the food products they trade. The origins of the guidelines, however, actually go back to 1977, when the UN's Economic and Social Council requested a survey of nations' regulatory and legal arrangements for consumer protection. The Council recognized that the developing world's efforts at advancement in production and technology would be enhanced if they were accompanied by adequate consumer protection.

After 3 years of debate, the UN adopted the guidelines in 1984. They are strictly voluntary and do not establish any law or system of international regulation. The guidelines set forth minimum standards that are usually accepted by UN members. If adopted worldwide, they could serve to increase international trade by removing differences in safety and other standards that limit trade.

Guidelines Have Three Components

The guidelines are divided into three parts: objectives, general principles, and suggested actions. The objectives of the guidelines are to improve consumer protection, encourage standards of conduct for producers and distributors, curb business practices that harm consumers, stimulate development of independent consumer groups, and improve global cooperation in the entire field.

The guidelines are based on what are the main principles of consumer protection in nearly all developed countries.

- Products should be safe and not of inferior quality.
- Business practices that negatively affect consumers' economic interests should be regulated.
- Consumers should have the necessary information and education required to make rational choices.
- Procedures should be provided for speedy redress of complaints.

The guidelines call for specific actions that carry out the objectives and principles. For example, in the area of physical safety, participating governments are to encourage manufacturers and distributors to comply with safety regulations and voluntary standards, maintain safety records, and educate consumers on proper handling and storage of products.

Government development of consumer education and information programs that are in keeping with the country's cultural traditions is also a key element of the guidelines. Special attention is urged for disadvantaged, low-income, or illiterate people.

The guidelines cover everything from food and water to pharmaceutical products. In the area of food, the guidelines encourage systematic monitoring by governments to assure that manufacturers, distributors, and others adhere to established laws and standards to prevent adulteration of foods, false or misleading claims in marketing, and service frauds.

Implications for International Trade

If the voluntary guidelines are implemented by individual countries, they could have worldwide implications. National standards intended to protect consumers in one country can limit international trade. The stricter standards of developed countries often serve as nontariff barriers for imported food products that might take away sales from domestic producers. Inadequate hygiene practices in food processing and handling, for instance, can cause importing countries to reject another country's products. However, if the developing countries adopt the physical safety and labeling standards recommended by the guidelines, importers would be assured of the composition and quality of foods. International standards and practices, therefore, might enable exporters in developing countries to compete with domestic producers in developed countries.

Without standards regulating product quality and safety, developing countries may also be vulnerable targets for inferior and unfit products. Unscrupulous manufacturers in countries with rigid safety standards and practices have produced substandard products for export. International standards would lessen the incidence of "dumping" inferior products.

Efforts are being made to implement the guidelines in developing countries. As the consumer movement strengthens in developing countries, more groups are springing up to address issues related to consumer rights—the right to complain, to safe products, and even to sufficient food and housing. These groups, plus the fact that consumer advocates are urging legislators in developing countries to pass protection laws, will probably lead to guideline implementation in many nations.

In May 1986, delegates from 35 developing countries met in New York City to set goals for implementing these guidelines. Consumer groups have already formed in some of these nations, but others are still trying to initiate them. China, for example, started its first consumer rights organization, the China Consumer Council, in December 1984. The council hears consumer complaints and negotiates solutions with manufacturers and retailers. Brazil is another example. Although the country has a consumer defense organization, consumer advocates are also pressing legislators to include protection laws in their new constitution. In October 1986, Esther Peterson, lobbyist for the International Organization for Consumers' Unions, traveled to Uruguay to discuss implementation of the guidelines in South American countries. □

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Food Spending and Income

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Personal consumption expenditures were were about $2.7 trillion (seasonally adjusted annual rate) in the second quarter of 1986, an increase of 6.2 percent from a year earlier. Of this total, $434 billion was for food, up 4.7 percent from 1985 *(table 1)*. Spending rose because of price increases, greater purchases of convenience foods, and growth in the total market. After adjusting for higher prices, food expenditures were up 2.5 percent from the second quarter of 1985.

Food-at-home expenditures reached $295 billion, up 3.6 percent from a year earlier, while away-from-home food spending was up 6.9 percent to $139 billion. After adjusting for inflation, which has been low in the food-at-home market, expenditures on food at home were up 2.4 percent from last year. In the away-from-home food market, expenditures rose 2.9 percent after adjusting for inflation. Prices in the restaurant industry have risen at a higher rate than those for food at home because marketing costs make up a larger share of restaurant meal prices than of food store prices.

Food expenditures were 14.6 percent of personal disposable (after-tax) income in the second quarter of 1986, unchanged from 1985. Data from the Bureau of Labor Statistic's 1984 Consumer Expenditure Interview Survey (the latest data available) reveals that the proportion of income spent on food varies widely among different income groups and generally declines as income rises. The percentages for the income groups were:

- less than $5,000, 49.7 percent of income;
- $5,000-9,999, 25.7 percent;
- $10,000-$14,999, 20.4 percent;
- $15,000-$19,999, 16.7 percent;
- $20,000-$29,999, 13.6 percent;
- $30,000-$39,999, 11.6 percent; and
- $40,000 and up, only 8.7 percent.

These figures include only households reporting income but do not account for possible underreporting of income. The average for all households surveyed was 13.1 percent of before-tax income. This figure is smaller than the percent of disposable income spent for food because food spending from the survey is measured against before-tax income, a larger number than disposable income. □

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Table 1. How Disposable Personal Income Is Spent[1]

	1985 II	1986 I	1986 II
	Billion dollars		
Disposable personal income	2,842.3	2,935.1	2,981.7
Total personal consumption expenditures	2,576.0	2,697.9	2,735.3
Nondurables	902.3	929.7	929.1
Food	414.7	429.9	434.1
At home	285.1	295.0	295.5
Away from home	129.6	134.9	138.6
Alcoholic beverages	53.6	54.7	55.9
At home	20.7	21.1	22.1
Away from home	32.9	33.6	33.8
Cleaning and household supplies	26.1	27.0	27.0
Toiletries	22.9	23.7	24.1
Tobacco	30.5	34.4	32.7
Drugs	28.2	29.3	30.2
Clothing and shoes	155.0	161.3	165.5
Gas and oil	92.8	87.6	78.2
Fuel oil and coal	15.3	14.9	13.7
Other	63.2	66.9	67.7
Durables	354.0	360.8	375.7
Motor vehicles and parts	165.3	163.5	173.3
Furniture and household equipment	125.9	132.1	136.2
Other	62.8	65.2	66.2
Services	1,319.7	1,407.4	1,430.5
Housing	399.1	424.8	434.8
Household operation	171.4	174.3	177.2
Transportation	88.1	93.5	95.3
Personal care	31.0	32.5	33.0
Medical care	287.7	307.9	313.3
Personal bus. service	167.9	189.4	192.0
Recreational services	67.6	70.5	70.4
Other	107.0	114.5	114.5
Savings	183.6	145.6	152.7
Other[2]	82.7	91.6	93.7

[1]Reflects data as of August 18, 1986. [2]Includes interest paid by consumers to businesses and personal transfer payments to foreigners.

Source: U.S. Department of Commerce, Bureau of Economic Analysis.

Current Trends in Domestic Food Programs

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Participation and program costs discussed in this article compare the April-June quarter of 1986 with the same 3 months of 1985, unless otherwise noted. Preliminary data are reported as of August 1986 and are subject to revision. Costs of entitlement and bonus commodities are included where applicable.

Average participation in the Food Stamp Program (FSP) fell 2 percent during the second quarter of 1986, to 19.6 million people. Food stamps are designed to assist low-income households to purchase a nutritionally adequate diet. Average monthly food stamp benefits per person increased from $44.79 to $45.46.

Federal expenditures for the FSP totaled $2.94 billion, virtually the same as in 1985. The value of benefits declined slightly, from $2.69 to $2.67 billion. Administrative expenses and other costs rose from $243 million to $271 million.

Child Nutrition Programs

Average participation in the National School Lunch Program in April and May increased about 1 percent, from 23.2 million participants in 1985 to 23.4 million in 1986. This program provides approximately one-third of the recommended dietary allowances for school-age children. Eligibility for free or reduced-price lunches is based on family size and income criteria. Approximately 42.5 percent of the lunches were free, 6.7 percent at a reduced price, and 50.8 percent full price. These percentages have remained relatively stable over the past several years.

Federal expenditures for the school lunch program, including cash, commodities, and cash-in-lieu of commodities, totaled $812 million in the second quarter of 1986, up from $759 million. Schools also received bonus commodities worth $40.3 million in 1986, compared with $42.4 million in 1985.

Participation in the WIC program increased from an average of 3.1 million in second-quarter 1985 to 3.3 million a year later.

The School Breakfast Program provided subsidized breakfasts to an average of 3.6 million children each day in April and May of 1986 and 3.5 million in the same months of 1985. A rise in free breakfasts, from 2.9 million to 3 million, accounted for most of the increase in 1986. Federal expenditures from the School Breakfast Program rose from $98.9 million to $107.3 million.

Day care homes and child care centers served an average of 59.1 million meals a day under the Child Care Food Program during the second quarter of 1986, an increase of 5.6 percent. Approximately 78 percent of the meals were free, 6 percent reduced price, and 16 percent paid. Program costs rose 9 percent, from $114 million in 1985 to $125 million in 1986.

The number of half-pints of milk served under the Special Milk Program declined slightly from 39 million in the second quarter of 1985 to 38 million in 1986. Federal expenditures remained virtually the same at $3.7 million.

Approximately 12.8 million meals were served to children under the Summer Food Service Program in 1986, a 1-percent decline from 13.6 million in the second quarter of 1985. Program costs in May and June were $21 million in 1986 and $20.7 million in 1985.

Supplemental Food Programs

Participation in the Special Supplemental Food Program for Women, Infants, and Children (WIC) increased from an average of 3.1 million in 1985 to 3.3 million in the second quarter of 1986. Food costs for the WIC program rose from $300 million to $318 million, a 6-percent increase. Average monthly benefits per person increased from $31.92 to $32.17. WIC provides low-income participants with foods that are rich in protein, iron, calcium, and vitamins A and C, nutrients that are often lacking in the diets of the target population.

The Commodity Supplemental Food Program (CSFP) operates in 12 States and the District of Columbia. The CSFP serves the same target population as the WIC program, but persons may not participate in both programs simultaneously. CSFP served an average of 136,000 persons per month in the second quarter of 1986, down from 137,400 in the same period in 1985. Food costs for CSFP, including bonus commodities, totaled $8.4 million in the second quarter of 1986.

Average participation in the Elderly Feeding Pilot Projects (which operate under the auspices of the CSFP) increased slightly from an average of 19,500 in 1985 to 19,800 in 1986. Food costs for the projects were $547,000, down from $570,000 in 1985.

Food Distribution Programs

Participants in the Food Distribution Program on Indian Reservations and the Trust

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Territories increased from 138,300 in the second quarter of 1985 to 145,900 in 1986. Lower food costs meant a decline in program spending, from $12.3 million in 1985 to $11.8 million in 1986.

Average daily participation in the Nutrition Program for the Elderly was 886,000 in second-quarter 1986, a decline of 2.2 percent from a year earlier. In the same period, Federal expenditures dropped from $31.2 million to $30.7 million. This program provides cash and some USDA-donated foods for people over 60 years of age and their spouses.

Federal expenditures for the Temporary Emergency Food Assistance Program were $220.5 million in 1986, compared with $253 million in 1985. This program provides food to the needy while reducing Government stocks of surplus commodities. □

Table 1. Federal Benefit Cost of USDA Food Programs[1]

Program	1983	1984	1985[2]	1985[2] (Quarters)				1986[2]	
				I	II	III	IV	I	II
				Million dollars					
Family Food									
Food Stamps	11,119	10,673	10,703	2,771	2,691	2,580	2,662	2,691	2,673
Nutr. Asst. Prog. in Puerto Rico[3]	825	825	825	206	206	206	205	205	205
Food Distribution									
Food Distribution on Indian Reservations	36	43	48	12	12	12	12	12	12
Schools[4]	821	828	851	273	159	144	275	270	160
Other[5]	229	225	201	45	56	59	41	50	89
Temporary Emergency Assistance[6]	1,106	1,057	908	260	253	189	206	209	220
Cash-in-lieu of Commodities[7]	126	133	142	35	35	35	37	37	35
Child Nutrition[8]									
School Lunch	2,443	2,552	2,609	807	644	327	831	827	695
School Breakfast	357	378	391	117	99	51	124	123	107
Child Care Food and Summer Food Serv. Prog.	407	454	500	101	119	173	107	110	129
	17	16	16	4	4	4	4	4	4
WIC[9]	1,194	1,417	1,511	368	375	382	387	394	397
Total[10]	18,680	18,601	18,705	4,999	4,653	4,162	4,891	4,932	4,726

[1]Calendar years. Administrative costs are excluded unless noted. [2]Preliminary. Quarterly data may not add to annual total due to rounding. [3]Puerto Rico transferred from the Food Stamp Program to a substitute nutrition assistance program on July 1, 1982. Represents appropriated amounts. [4]National School Lunch, Child Care Food, Summer Food Service programs, and commodity schools. [5]Commodity Supplemental Food Program, Elderly Feeding Pilot Project, Nutrition Program for the Elderly, and donations to charitable institutions. [6]Initiated December 1981. [7]Child nutrition programs and the Nutrition Program for the Elderly. [8]Cash expenditures. [9]Special Supplemental Food Program for Women, Infants, and Children. Includes administrative costs. [10]May not add due to rounding.

Source: Data from the Food and Nutrition Service.

USDA Actions

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USDA regularly implements operational and regulatory changes that affect the status of food and nutrition in the United States. Here are some actions relevant to the food situation.

Autogenous Biological Products. New regulations proposed by USDA would allow Federal licensing of veterinary biologics manufacturers who produce only autogenous products. An autogenous biologic is a product that has been prepared from a culture of microorganisms that was derived from a sick animal. The infected herd or flock is then treated with the finished product. Such biologics are used primarily during emergencies to treat animal diseases for which there is no licensed product. Currently manufacturers are licensed if they make nonautogenous products, such as vaccines or bacterins, but once licensed, they may then produce autogenous products as well.

Beef Promotion and Research. USDA issued a final rule implementing a national beef promotion and research order to strengthen the position of beef in the marketplace. The program is funded by a mandatory $1 per head assessment on all cattle marketed in the United States, as well as an equivalent amount on imported cattle and beef. The program will be administered by the Cattleman's Beef Promotion and Research Board, made up of about 113 cattle producers and importers nominated by the industry and appointed by the Secretary of Agriculture. Producer assessments began October 1.

Pork Promotion, Research, and Consumer Information Order. Secretary of Agriculture Richard E. Lyng announced a final order implementing a national pork promotion, research, and consumer information order and the appointment of 160 pork producers and importers to the National Pork Producers Delegate Body. The program will be funded by a mandatory assessment of up to ¼ of 1 percent of the market value of each hog sold in the United States, as well as an equivalent amount on imported hogs, pork, and pork products.

Substances in Fresh Pork. An interim final rule has been proposed by USDA that would permit the controlled use of substances that maintain the color of fresh pork cuts for the duration of their normal, safe shelf-life. The substances are ascorbic acid, erythorbic acid, citric acid, sodium ascorbate, and sodium citrate. Fresh pork cuts lose their color long before they become unsafe to eat, and some consumers find the off-color less desirable. USDA's Food Safety and Inspection Service reviewed data that indicated that certain acidic substances can safely extend the acceptable color and ap-

The author is a social science analyst with the Food and Agricultural Policy Branch of the National Economics Division.

pearance of fresh pork. Only processors operating under a USDA-approved partial quality control program will be allowed to use the substances. Under this program, plants establish controls at certain processing steps, which are monitored by USDA inspectors to assure correct operation. In addition, the prescribed conditions under which the substances are permitted will ensure they do not mask signs of food spoilage.

Inspection Exemption for Certain Central Kitchens. Certain central kitchens of restaurants are now exempt from routine inspection by USDA. The eligible kitchens—there are currently about 40—are those that transport ready-to-eat meat and poultry products directly to their satellite restaurants or vending machines for serving to customers. To be eligible for the exemption, a central kitchen's products may not be stored, sold, or otherwise change hands before arriving at the outlets, and both the central kitchen and the outlets must be owned or operated by the same legal entity.

Donated Food Delivery. USDA has proposed streamlining the two delivery sytems used for getting surplus food to schools, charitable institutions, and other eligible participants into one system. The new National Inventory System (NIS), which is being tested this year in six States, would replace delivery systems now operated by States and USDA's Food and Nutrition Service. The Secretary of Agriculture will designate which donated foods are available through NIS. Under the current systems, these include cheese, nonfat dry milk, butter, and honey.

Restructured Meat Product Binder Use. The Department of Agriculture has begun permitting meat processors to use a combination of dry substances to create a binder for restructured meat products. The name of the binder must be included on the label next to the product's name. Restructuring is the process of taking flaked, sectioned, or chunked meat and binding the pieces to resemble intact cuts of meat. The final products take on a variety of shapes, such as nuggets, roasts, loaves, and steaks. The binder is formed by combining sodium alginate, calcium carbonate, lactic acid, and calcium lactate. When these compounds are added to raw meat pieces, they react to form calcium alginate, the compound that holds the pieces together. All of these substances have been approved by the Food and Drug Administration.

Pineapple Juice Grade Standards. The Agriculture Department has proposed revisions in its voluntary grade standards for canned pineapple juice to improve them and bring them into line with other revised standards. The major amendments would align U.S. grade standards with Food and Drug Administration standards, eliminate reference to the words "canned" or "canning" and substitute "processing" where appropriate, provide grade standards for pineapple juice from concentrate, establish minimum soluble solids content for pineapple juice from concentrate, and redesignate the grade name U.S. Grade C in the current canned pineapple juice standards to U.S. Grade B.

Sugar Sale to China. USDA sold its entire inventory of 145,850 metric tons of surplus raw cane sugar to the People's Republic of China at 4.75 cents a pound. The sugar was sold at a price that included its delivery on board ship at U.S. export ports and will be delivered during January-March 1987. No credit arrangements were involved in the sale.

Targeted Export Assistance Program for Canned Fruit. A $5.1 million USDA program to expand exports of canned peaches and fruit cocktail, especially to Pacific Rim and Middle East countries, will run through fiscal year 1987. The program is intended to help the U.S. industry counter or offset imports of subsidized products from the European Community.

Labeling Meat with Barbecue Sauce. USDA changed its labeling requirements for pork and beef products packed in barbecue sauce to be consistent with those for similar poultry and nonmeat products. Previously, "pork with barbecue sauce" and "beef with barbecue sauce" were the only products on which labels were required to state prominently that the sauce contained thickeners, binders, and similar substances. The new rule allows processors to remove the prominent labeling statements identifying these binding and thickening ingredients.

Meat and Poultry Plant Hours of Operation. USDA now allows qualified meat and poultry processing plants operating under the voluntary Total Quality Control (TQC) inspection system to expand hours per day from 8 to a maximum of 12. Approximately 500 plants use USDA-approved quality control systems to ensure wholesome and accurately labeled products. Under the new rule, plants that have operated under approved TQC systems for at least 1 year can request expansion of daily schedules to 12 hours. During the additional 4 hours of operation, plants can produce and transport products without an inspector being present. Several provisions of the new rule ensure adequate control of the products. For example, special codes are assigned to products processed after the regular 8-hour shift, and inspectors will spot check plants during the expanded hours and take samples when they feel it necessary. □

Food and Nutrition Legislation

Lewrene Glaser
(202) 786-1780

Numerous food and nutrition bills were introduced in the 99th session of Congress. Some of the legislation is described below.

Food Assistance

H.R.5133—Rep. Mickey Leland (D-TX)

The Food Assistance for the Homeless Act would permit State agencies to conduct food stamp outreach programs targeted at homeless individuals. The homeless would be able to use their food stamps at nonprofit shelters that offer food services. Persons using food stamps could not be charged more for a meal or packaged food than those paying cash.

H.R.5145—Rep. Bruce Vento (D-MN)

This bill would amend the Temporary Emergency Food Assistance Act of 1983 to require that excess cheese held by the Commodity Credit Corporation (CCC) be made available to States, at the request of the Governor, for distribution by eligible agencies. The Governor would have to certify need, and the CCC would have to deliver the cheese without charge and in usable form. Excess cheese is defined in the bill as that acquired by the CCC, minus quantities used for international market development, food aid, and other commitments.

Food Safety and Quality

S.2512—Sen. Orrin Hatch (R-UT)

The Food Safety Modernization Act of 1986 would amend the three so-called Delaney clauses contained in the Federal Food, Drug, and Cosmetic Act. Presently, the law states that no food additive, color additive, or animal drug residue is safe if it causes cancer in man or animals. This bill would change the language so that no additive or residue is deemed safe if the substance as a whole is found to induce cancer in man or animals. For example, saccharin, and not its chemical components, would be evaluated for carcinogenic effects. The clause would not apply if the Food and Drug Administration (FDA) determined—based on scientifically adequate evidence—that the risk of cancer to humans from exposure to the substance under the intended conditions of its use was negligible. S.2512 would also define "safe" to mean a reasonable certainty that the risks to health from a substance under the intended conditions of use are negligible.

The bill contains new phaseout provisions for substances—including drug residues in meat and poultry—in use but no longer recognized as safe. FDA or USDA would be able to allow continued use of an additive or residue if there is no unreasonable risk to the public health. A phaseout period, however, would only be permitted as long as a practicable substitute did not exist. In determining the length and conditions of a phaseout, FDA and USDA would have to consider the risks associated with the use of the substance and those associated with prohibiting it; the effects of the substance on the nutritional value, cost, and availability of food; and the uses of the substance for dietary management and other health-related purposes. During the phaseout, the agencies would be authorized to reduce the amount of the additive or residue allowed in food, restrict the foods in which it may be used, and issue labeling or packaging requirements.

S.2512 would also allow FDA to consider the benefits to human health of a food additive that has a long history of use and for which there are no practicable substitutes before prohibiting its use. Possible examples of this are saccharin, BHA, and nitrites. The FDA would be able to conduct risk-benefit analysis to determine how the public health would best be served. USDA and FDA would also be required to establish regulations that specify procedures for independent scientific peer review of "substantial scientific" issues related to food safety.

S.2622—Sen. William Roth (R-DE)
and H.R.5105—Rep. Beau Boulter (R-TX)

The Meat, Poultry, and Egg Products Inspection Improvements Act of 1986 asserts that periodic and unannounced inspections of meat, egg, and poultry processing plants would be less expensive and more effective than the continuous inspections currently made. The bill would authorize USDA to conduct inspections in such a manner and frequency as necessary, based on: the nature of the plant's operations, the adequacy and reliability of the plant's product monitoring system, the history of compliance with inspection requirements, and any other factor considered appropriate. Egg breaking operations, however, would still be continuously monitored. Meat and poultry labels would be changed to read "Prepared in a USDA inspected establishment." □

The author is an agricultural economist with the Food and Agricultural Policy Branch of the National Economics Division.

In the News...

Processed Foods' Share Has Changed Little in a Century

The share of food that is processed (omitting food produced at home) has changed remarkably little in more than a century—87 percent of purchased foods were manufactured in 1869, 80 percent in 1909, and 90 percent in 1980. But the kinds of foods processed, the type of processing, and the nature of the food manufacturing industry have changed dramatically.

In 1869, flour and cornmeal accounted for 52 percent of processed food products. Cured meats, dairy products, and sugar accounted for another 37 percent. By 1982, flour and other grain products accounted for only 3 percent, bakery products 10 percent, meat and poultry 23 percent, processed fruits and vegetables 17 percent, and soft drinks 11 percent. Many new industries appeared and grew to considerable size during that period, mostly as a result of new technologies dealing with frozen and dehydrated foods, soft drinks, and fresh meat.

Large corporations have been a feature of agricultural processing and distribution for 100 years. The 50 largest firms have accounted for about 45 percent of all output, while the next 450 firms have maintained a one-third output share.

For further information, call Alden Manchester, (202) 786-1880.

Eastern Potato Growers Face a Shrinking Market

Potato producers in Maine and other traditional eastern growing areas are facing stiff competition from the Western States and, to a lesser extent, from Canada, in eastern U.S. markets. Since 1960, western growers have expanded fresh potato marketings in eastern U.S. cities. Maine and the other Eastern States (New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, Pennsylvania, and New York) both supplied about 28 percent of total U.S. potato production in the early 1960's. By the 1980's, Maine grew only about 7 percent and the other Eastern States 6 percent. On the other hand, the Western States increased production from about 31 to 54 percent. Producers of spring and summer crop

Western growers have gained market shares because they produce most of the russet potatoes consumers seem to prefer.

potatoes (Florida, Texas, California, New Mexico, South Carolina, Virginia, and Louisiana) also lost production shares between the 1960's and the 1980's.

The Western States have gained market shares in eastern U.S. markets because they produce most of the russet potatoes that consumers seem to prefer. Not only are russets the current favorite in the fresh market, they are also preferred by the expanding processing industry because they make the best frozen french fries. With growing fast food consumption and consumers' desire for convenience, processed products make up the majority of potato consumption in the 1980's. One processed product well suited to the East's round white potatoes is potato chips. However, production of chips has not increased nearly as fast as frozen potatoes. Production of chips has risen only 16.2 million hundredweight (cwt) since the early 1960's, compared with an increase of 75 million cwt for frozen products.

Canada has also pushed into the eastern growers' market, but not to the extent of the Western States. Canada's strongest gains have been in Boston, with about an 11-percent market share in the early 1980's, New York City 6.6 percent, and Philadelphia 5.4 percent. South of Baltimore, however, the Canadian market share is well below 1 percent and decreases as distance increases.

For more information, contact Katharine C. Buckley, (202) 786-1768.

Japan Remains Top Market for U.S. Farm Products

Japan remained the leading single-country market for U.S. agricultural exports in U.S. fiscal 1986, as it has been every year since 1963. Despite its number-one spot, U.S. farm exports to Japan dropped for the second straight year. After peaking at $6.9 billion in fiscal 1984, sales fell to about $5 billion in fiscal 1986. Depressed commodity prices and declining U.S. shares for key products were behind the drop.

Japan is a large and steady market for many U.S. agricultural products. The country usually ranks first or second in value as an importer of such major U.S. products as wheat, corn, sorghum, soybeans, cattle hides, cotton, tobacco, citrus fruit, beef and veal, pork, and poultry. Nevertheless, Japan is also a significant market for other exporters, namely New Zealand, Canada, and Australia. Furthermore, in the last 2 years, Japan has become a leading destination for corn and cotton from China, which is pushing agricultural exports as a means of reducing its trade deficit with Japan.

Although U.S. agricultural trade with Japan relies mostly on bulk commodities, such as grain and soybeans, the United States has been promoting expanded trade in high-value and processed products, including beef and citrus. Following trade talks in 1984, Japan agreed to expand its imports of U.S. beef, fresh oranges, and citrus juice through Japanese fiscal year 1987 (April 1987-March 1988).

The U.S. share of Japan's imports declined last year for several important commodities, including corn, soybeans, and cotton. China's emergence as an agricultural exporter, uncompetitive U.S. prices, and Japan's dissatisfaction with the quality of U.S. grains and oilseeds were chiefly responsible for the drop in the U.S. share

of these markets. In addition, the U.S. share of Japan's pork imports fell to a 6-percent low, hurt by the strong dollar, high U.S. prices, and stiff competition from Denmark and Taiwan. The U.S. share of Japan's poultry meat imports declined because of competition from Thailand and Brazil.

For more information, contact Lois Caplan, (202) 786-1611.

Brazilian Orange Industry Finds Growth in U.S. Market

Brazil, the largest orange producer in the world, accounted for one-third of the world's orange crop in 1984. Brazil has become a major force in the world market for frozen concentrated orange juice (FCOJ) in the last decade. While the Brazilian orange industry has been growing, Florida producers have encountered a series of disastrous freezes since 1981. These freezes have reduced orange production from a 206-million-box record in 1979/80 to 1985/86's 119 million. With the decline in U.S. orange production, U.S. imports of FCOJ from Brazil almost tripled from 1980/81 to 1984/85. Consequently, Brazil's share of the U.S. FCOJ market has grown substantially during the last 5 years.

The orange crop in the commercial zone of San Paulo, Brazil, was a record 230 million boxes in 1985/86. Although the weather was extremely dry, other factors boosted output: more trees coming into production, less selective picking, and slightly higher yields. Brazil's total exports of FCOJ during 1985/86 were an estimated 600,000 metric tons, compared with 715,000 in 1984/85. The reduced exports were due primarily to the increased FCOJ pack in Florida and lower purchases from Europe. High prices meant reduced exports during the first half of 1985/86. However, exports improved somewhat during the last half of the year because of the dramatic decline in FCOJ prices.

Brazilian orange production in 1986/87 is expected to be down somewhat because of a drought from June 1985 until mid-January 1986. In addition, juice yields will likely fall because the drought caused the fruit to ripen unevenly. Nevertheless, a sharp increase in FCOJ exports is expected for 1986/87 because of greatly reduced prices in Brazil.

After several extremely profitable years in a row for the Brazilian orange industry, due primarily to Florida freezes, processors have reportedly lost millions of dollars because of weak international prices and higher prices paid to orange producers. The Brazilian Government has removed the minimum export price and quota for FCOJ, which will significantly affect both producers and processors. Over time, it had become apparent that these policies were not accomplishing the Government's objective to strengthen Brazil's returns in the international market.

For more information, contact Ben Huang, (202) 786-1766.

Table 1. Brazil Takes Lion's Share of Steadily Rising U.S. FCOJ Imports

Season[1]	Brazil	Others	Total
		1,000 gallons[2]	
1969/70	1,308	153	1,461
1970/71	15,413	3,930	19,343
1971/72	29,210	8,865	38,075
1972/73	12,924	7,300	20,224
1973/74	12,699	5,549	18,248
1974/75	28,214	4,832	33,046
1975/76	29,755	1,647	31,402
1976/77	33,749	14,177	47,926
1977/78	139,451	11,290	150,741
1978/79	152,310	7,708	160,018
1979/80	97,676	2,338	100,014
1980/81	203,104	11,127	214,231
1981/82	373,988	22,084	396,072
1982/83	337,164	27,605	364,769
1983/84	510,094	23,476	533,570
1984/85	578,177	18,456	596,633

[1]Season beginning December 1. [2]Single strength.

Source: Foreign Agricultural Service, USDA.

Lower Production Forecast for Most Crops

Total domestic output for most of the 10 major field crops will be less this season than in recent years. For most crops, declines resulted from reduced plantings brought about by increased participation in commodity programs.

The season-long drought in the Southeast and, to a lesser extent, the hot, dry weather that developed midseason in the Delta, Kentucky, and Tennessee had a severe effect on regional crop production. But for most major field crops, particularly food and feed grains, the regional bad weather had a negligible impact on the country as a whole.

Growing conditions were good to excellent in the Midwest and Northern Plains, where the bulk of the U.S. corn, soybean, and spring wheat crops is grown. Consequently, above-average production in these regions is offsetting losses due to drought.

For 1986, 85 percent of the peanut crop, 94 percent of the tobacco crop, and a greater share of the soybean and cotton crops (compared with grains) were grown in the drought-affected Southern States. Consequently, the drought had a relatively greater impact on production of the four major nongrain field crops.

For more details, contact Michael Hanthorn, (202) 786-1841. □

Reports of Interest. . .

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Food Cost Review, 1985, by Denis Dunham. AER-559. July 1986. 56 pp. $2.75. Order SN: 001-019-00477-1.

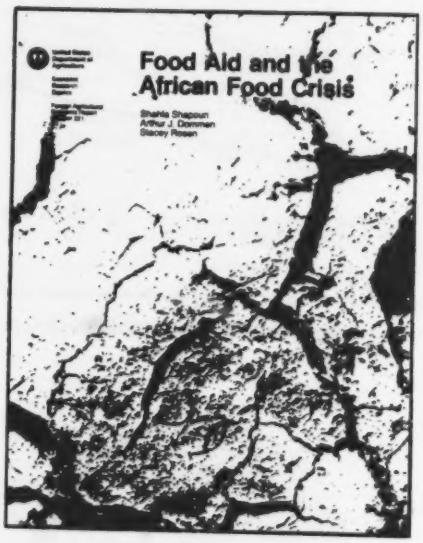
Discusses how much food prices rose in 1985 and why, how much of the retail food price is returned to the farm, and how farm-to-retail price spreads changed last year. Also shows how much Americans spend for farm-produced foods and how these dollars are divided among costs of producing and marketing food.

U.S. Demand for Food: Household Expenditures, Demographics, and Projections, by James R. Blaylock and David M. Smallwood. TB-1713. February 1986. 60 pp. $2.25. Order SN: 001-019-00436-3.

The report finds that higher income households spend more per person on most food groups, especially beef, fish, cheese, vegetables, butter, and alcoholic beverages, than do lower income households. Elderly Americans spend less than younger people on food away from home and alcoholic beverages.

Potential Bans of Corn and Soybean Pesticides: Economic Implications for Farmers and Consumers, by Craig Osteen and Fred Kuchler. AER-546. April 1986. 28 pp. $1.50. Order SN: 001-019-00438-0.

Through cost and yield assessments, this report finds that removing corn and soybean pesticides that present environmental and safety risks from the market could increase



U.S. farm production costs, crop prices, farm incomes, and consumer expenditures, causing farmers to gain and consumers to lose.

Florida and Mexico Competition for the Winter Fresh Vegetable Market, by Katharine C. Buckley, John J. Van Sickle, Maury E. Bredahl, Emil Belibasis, and Nicholas Gutierrez. AER-556. June 1986. 112 pp. $5.00. Order SN: 001-01900474-6.

Discusses the cost competitive position of Florida and Mexico in supplying fresh tomatoes, bell peppers, cucumbers, squash, eggplant, and green beans to U.S. markets during the 1984/85 production season. The analysis shows that vegetable growers in the State of Sinaloa, Mexico, can produce the six vegetables more cheaply than Florida growers can. Import and export fees at the U.S. border, however, increase total costs for Mexican producers to the point that they exceed total costs in Florida for all vegetables, except cucumbers.

Assessment of a Marketing Order Prorate Suspension: A Study of California-Arizona Navel Oranges, by Nicholas J. Powers, Glenn A. Zepp, and Frederic L. Hoff. AER-557. June 1986. 44 pp. $2.25. Order SN: 001-019-00470-3.

Compares orange price and shipment data for 1984/85 with comparable weeks of several prorate periods. Finds that the market performed in about the same way during the 1984/85 season after the handler prorate was suspended as during the prorate periods.

U.S.-State Agricultural Data, by Letricia M. Womack, Larry G. Traub, and Mary H. Rivers. AIB-501. August 1986. 108 pp. $4.75. Order SN: 001-019-00479-7.

Presents agricultural information for each of the 50 States and the United States, including data on population, land use, agricultural production, farm income, value of assets on farms, and selected characteristics of farms such as size, tenure, and farm organization.

Food Aid and the African Food Crisis, by Shahla Shapouri, Arthur J. Dommen, and Stacey Rosen. FAER-221. June 1986. 112 pp. $5.00. Order SN: 001-019-00460-6.

Investigates the causes of the food crises in 11 selected African countries, analyzes the variability and slow growth in food availability, and examines why domestic resources were not adequate to support diets and prevent per capita food supplies from declining.

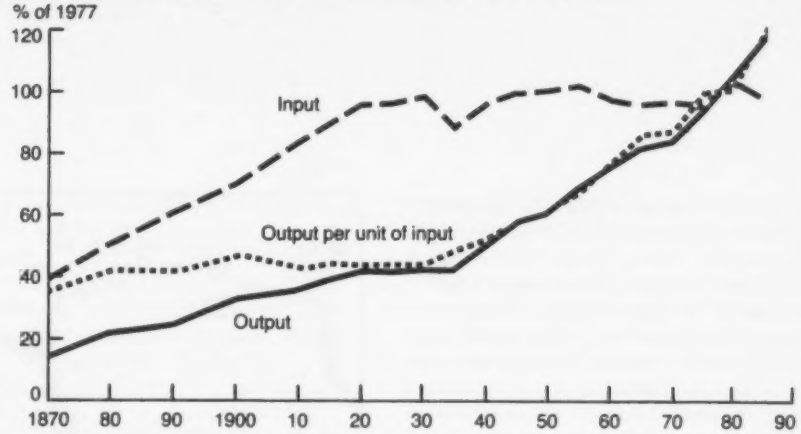
The 1984 U.S.-Japan Beef and Citrus Understanding: An Evaluation, by William T. Coyle. FAER-227. July 1986. 44 pp. $2.25. Order SN: 001-019-00452-5.

A 1984 understanding between the United States and Japan tempered, at least for the time being, U.S. accusations that Japan unreasonably restricts agricultural imports. This report outlines provisions of the understanding, puts the beef and citrus issue into a historical context, and evaluates the understanding's measures in terms of how closely they bring Japan's beef and citrus markets to "free trade" conditions.

Changes From Farm to Retail

Changes in agriculture boosted productivity. Output per unit of input rose 243 percent between 1870 and 1985, much of it during the past 30 years. These increases resulted from many factors, including the expansion of the Nation's agriculture into the more productive lands of the Midwest, shifts among crops, and improvements in farm management, pest control, and cropping techniques. Applied genetics alone has probably accounted for as much as 50 percent of harvest increases since the 1930's.

Greater Farm Productivity Means More Output From Inputs

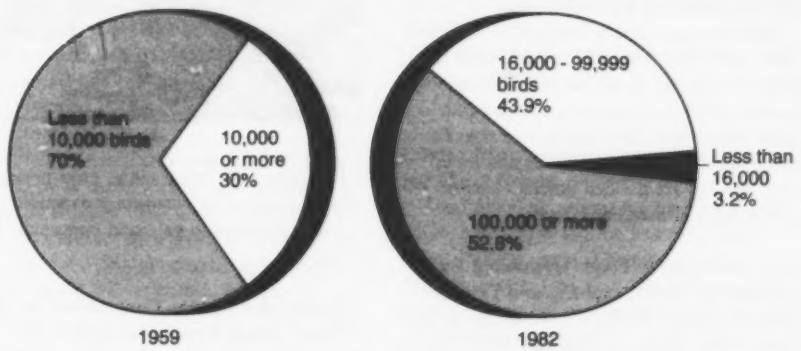


1985 preliminary.

Turkey production is a good example of expanded productivity in the farm sector. Turkey production has evolved from a secondary farm enterprise to a highly specialized industry over the past three decades. Specialization has meant fewer but larger operations. The number of farms producing turkeys, as listed in the Agricultural Census, dropped from 88,399 in 1959 to 26,638 in 1978. Most of the farms produced turkeys for home use, and by 1982, only 7,498 farms sold turkeys commercially.

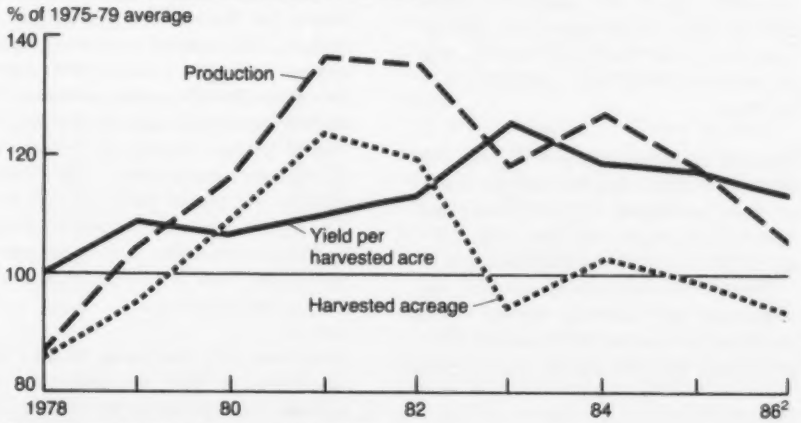
In 1959, 70 percent of turkeys were sold by farms with less than 10,000 head. By 1982, one-third of the farms raising turkeys sold 96 percent of all the birds. Farms with more than 100,000 head accounted for about 53 percent of all turkeys sold.

Larger Operations Account For Greater Share of Turkeys Sold



The widening use of high-yielding varieties of wheat has maintained U.S. production despite lower harvested acreage. Yield per harvested acre has risen 13 percent from the 1975-79 average, while acreage declined about 1 percent. Total production in 1985 was 18.5 percent above the 5-year average. In 1985, record yields in many producing States often increased production, despite heavy participation in Government acreage reduction programs. Preliminary estimates for 1986 indicate production likely exceeded the 1975-79 average by about 6 percent, despite an almost 7-percent decline in harvested acreage.

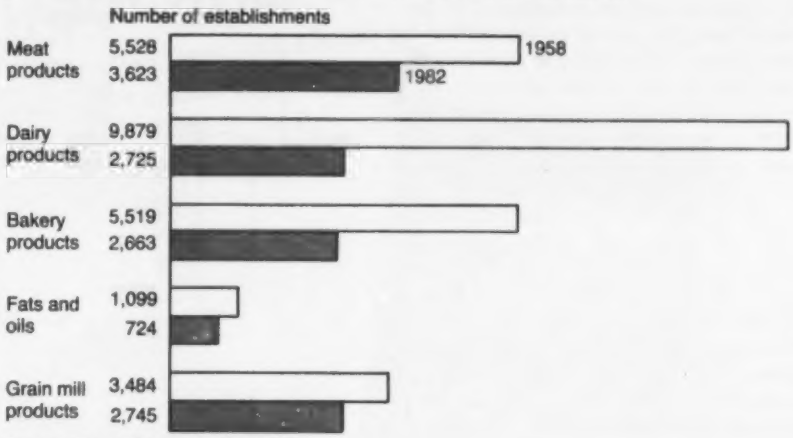
Wheat Acreage Declines While Yields Rise[1]



[1]Crop year beginning June 1. September 1, 1986, indications.
[2]Preliminary.

Changes in the number and size of food processors have paralleled changes in the number and size of U.S. farms. The farms are fewer, and they are larger. All categories of manufacturing establishments processing the major farm products declined between 1958 and 1982, with the largest drop in the dairy industry. The smaller number of food processing plants, however, handled a substantially larger quantity of raw agricultural products. Improvements in transportation and processing techniques have made large-scale plants far more efficient.

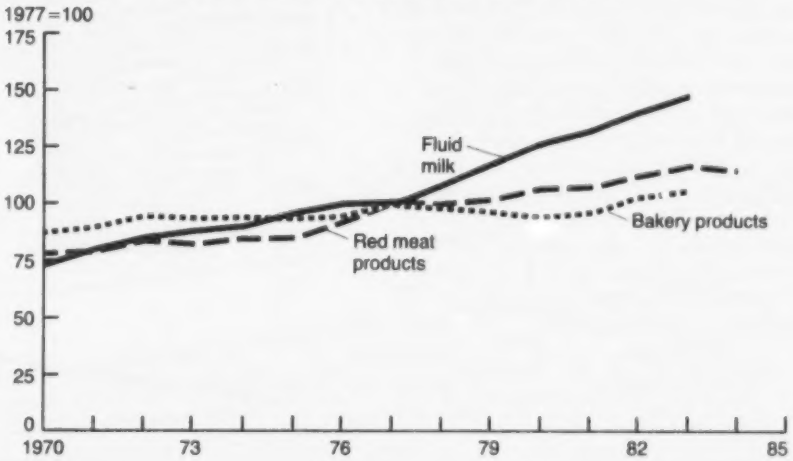
Food Processing Also Shows Trend Toward Fewer But Larger



Source: 1958 and 1982 Census of Manufactures.

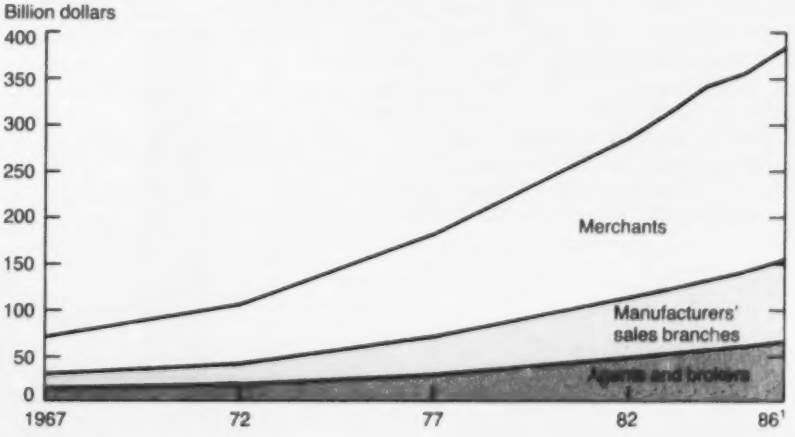
Output per unit of labor in food manufacturing has shown a steady increase of 2 to 3 percent a year over the past 15 years. These increases have resulted from an upward trend in output and a small decline in hours worked, reflecting in part the substitution of capital for labor as a consequence of new technology. Labor productivity among food manufacturers has increased the most for fluid milk processors. However, productivity has grown erratically for most other industries, partly because of ups and downs in farm output and business conditions.

Output Per Unit of Food Manufacturing Labor Gained Steadily



Sales by food wholesalers have grown about 10 percent a year over the past two decades and likely reached $385 billion in 1986. Increases in the number of independent supermarket operations, rapid growth in convenience stores, and expanded service to chain stores have spurred demand for food wholesalers' services.

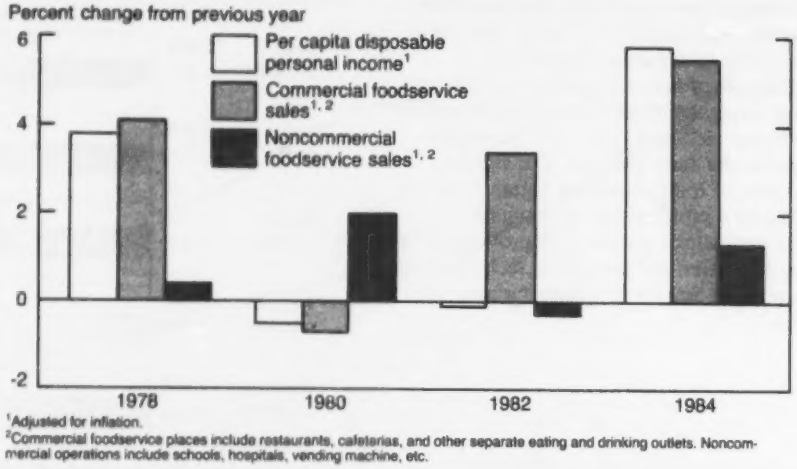
Sales by Food Wholesalers Show Rapid Growth



[1]Estimated by Economic Research Service.

Looking at year-to-year changes reveals the impact of real income (adjusted for inflation) and other factors on foodservice sales. Factors contributing to slow growth from 1980 to 1982 include declines in real per capita disposable personal income (DPI), a sharp drop in median family income during 1979-82, high energy prices (which not only meant increased costs for foodservice operations but also influenced consumers to stay home more), and greater increases in foodservice menu prices than in grocery store prices. The economic upturn in 1983 and 1984—characterized by sizable increases in gross national product and per capita DPI, lower rates of inflation and unemployment, and lower energy prices—spawned significant increases in foodservice sales.

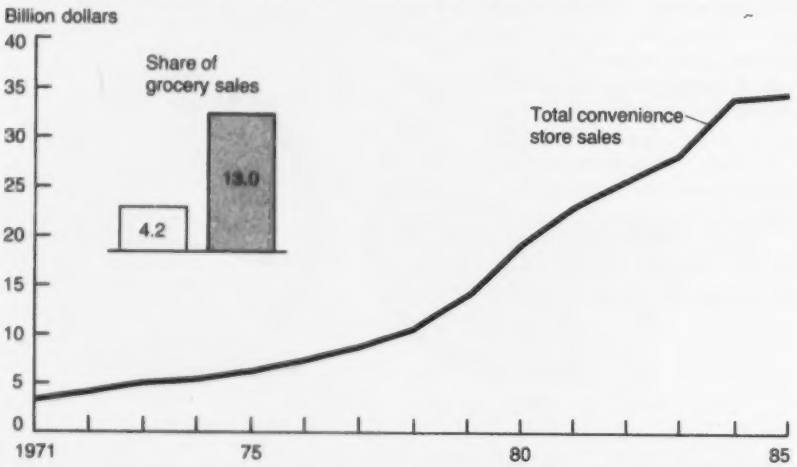
Income and Other Factors Influence Foodservice Sales



[1]Adjusted for inflation.
[2]Commercial foodservice places include restaurants, cafeterias, and other separate eating and drinking outlets. Noncommercial operations include schools, hospitals, vending machine, etc.

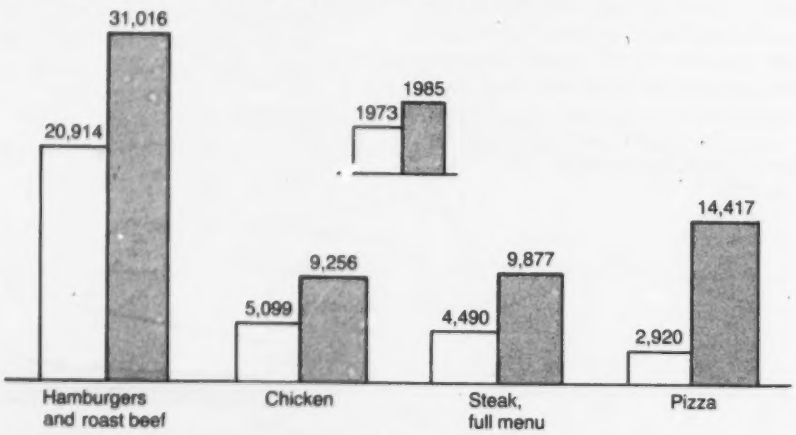
Convenience stores—small grocery stores that offer a limited number of food and other products and are usually open long hours—have taken advantage of today's opportunities for growth. Convenience stores have continued to maintain high growth rates by introducing such products as self-service gasoline and fast food. A number of convenience store retailers have installed limited-menu food service, often with customer seating as well as carryout service. As a result, convenience stores accounted for 13 percent of all grocery store sales in 1985, up from 4.2 percent in 1971.

On-the-Go Consumers Boost Convenience Store Sales



Eating away from home increased from 28 percent of our food spending in 1962 to over 43 percent in 1985, with fast food outlets getting a growing share. Between 1973 and 1985, the number of franchise establishments that primarily sell chicken rose almost 82 percent, while those selling primarily hamburgers and roast beef increased 48 percent. Pizza franchises were the big winners, rising almost 400 percent between 1973 and 1985.

Pizza Franchises Show Largest Increase Since 1973



Source: U. S. Department of Commerce, *Franchising in the Economy.*

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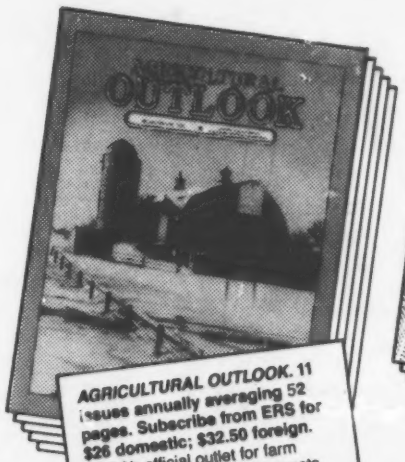

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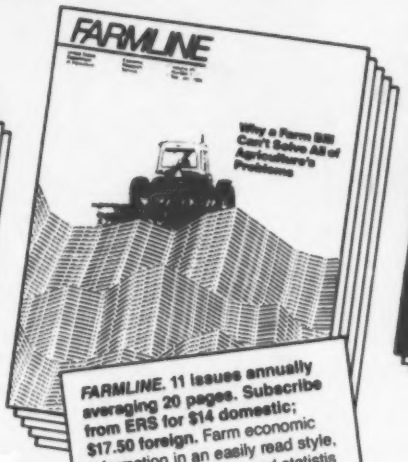

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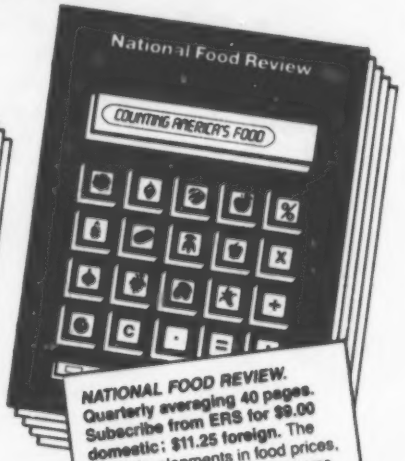

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